GR 1300 SERIES

RADAR TEST SET GENERATOR

OPERATING AND SERVICE MANUAL

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GR 1300
OPERATING AND
SERVICE MANUAL

MODEL: GR 1303 A

SERIAL NUMBER: 884274

OPTIONS: 30 - 284E

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CAUTION

GR 1300

(DAS 284E)

The delivered instrument profits by an important modification in order to reduce or even to cancel the leakage problems found in the GR 1300 series generators.

This special adaptation which bears the serial number DAS 284E has required the substitution of the YIG POWER SUPPLY board (501506) by an INTERFACE board for the YIG OSCILLATOR POWER SUPPLY (503506) in order to become entirely compatible with the use of a microwave subsystem set in the GP 2000 series generators.

Consequently, in the service manual, the chapter 7.4 has been modified because of using a YIG box in which is inserted in a standard way, the YIG POWER SUPPLY board (520568).

The other chapters of this manual, those reserved to the operating mode and those intended for the maintenance stay applicable as a whole, the modification passing unnoticed for the operator.

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1. GENERAL INFORMATION

1.1 INTRODUCTION

The series of GR 1300 generators cover the frequency area from 1 to 18 GHz in different band up to the octave. Coupled with a GW 1300 sweep generator, they allow a wide band vobulation and possess modulation and attenuation characteristics matched with radar repeaters.

They are aimed at all users who wish to study or test radar equipment on the ground, airborne or seaborne and certain counter-measure systems.

The microwave signal is generated by a transistor oscillator, the frequency of which is controlled by a YIG. This allows the elimination of mechanical components usually encountered as well as various problems such as : mechanical gap resulting in HF leaks, microphony, fidelity, setability band accuracy.

As well as this, the YIG driver circuit uses a special patent system, assuring a considerable reduction in the magnetic lag found in this type of source. The level control is carried out by two attenuators, one resistant for 10dB steps and other with PIN diodes for a variation from 0 to 11dB. PIN diodes are also used for the calibration and the modulation.

The modular and rational design of the GR 1300 generators facilitates utilization and maintenance.

1.2 PRESENTATION

The GR 1300 is presented in a standard (2U) table-top case which can also be set up in a rack by means of a rack mount (option 05)

Various switches allow selection of the utilization required of the generator. The frequency and the level stability is carried out by multi-position switches and by multi-turn potentiometers which permit high accuracy of the output signal. The values of these parameters are shown on a 7 segments/5 characters display panel. In a pulse system, the delay, the repetition and the width of the pulse are set by numerical contacters (or thumbwheels switches).

The insertion losses of the connection cables or circuits are compensated by a calibration dispositive.

1.3 CONSTITUTION

The modular design of the GR 1300 is composed of two distinct parts :

1.3.1 The microwave part

The microwave components are inter-dependent with the transversal brackets fixed to the under-carriage.

The connection between the different components is made by a semi-rigid coaxial cable.

The frequency generation is produced by a YIG crystal oscillator. The peculiar characteristic of the YIG sphere is a resonant frequency strictly proportional to magnetic field. The tuning is achieved through a current command in a coil.

As the design of the microwave chain is exclusively of a monoband type, the same combination of base components is found in all versions of the GR 1300.

1.3.2 The electronic part

This component can be divided into 3 main sub-assemblies :

- The power supply linked to the line transformer.
- The pulse generator which groups together all the modulation characteristics.
- The component which controls the frequency/level including the calibration dispositive.

1.4. SAFETY

1.4.1. Operator's safety

CAUTION DANGER !!!

. Never use this instrument without being sure the case is properly connected to the earth, as long as body contact with metallic parts could cause electrical shock.

. Disconnect the instrument from the mains prior to any mechanical dismounting, soldering operation or replacement of a component.

. Operate carefully when the instrument is connected to the mains, especially in the power supply box. Don't touch the wires when the mains are connected up and insure your safety by never being alone during operation so that you can have help supplied in emergency case.

1.4.2. Hardware safety

The equipment has been designed to operate with mains of 100V, 120V, 220V or 240V eff. (± 10 %) between the phase conductors and/or between a phase conductor and the frame depending on the selection. An earth conductor connected to the frame is present in the power cord, it is most important you connect it to the earth for maximum safety.
Only use the appropriate fuses which characteristics can be found in the parts list and in the paragraph 3.1.4. concerning the mains connection. This fuse must be conform to the precise model (type, voltage, current).

1.5. ASSISTANCE

Generally, when you have a problem concerning the operation, the use or the adaptation, it is better to consult the nearest agent or the GIGA INSTRUMENTATION Company.

1.5.1. Under warranty instruments

In that case, the instrument should be sent back to GIGA (or an agreed agent) inside its original package. Please specify the precise encountered problem.
The cost for labour, spare parts and return of the instruments are in charge of GIGA. This warranty covers a normal use of the instrument, the failure that could result of incorrect use of the instrument would not be taken into account.

1.5.2. Out of warranty instruments

The instrument should be sent back to GIGA (or an agreed agent) inside its original package.
After diagnostic, a repair estimate will be sent to you on. Acceptance of this estimate, the repair is carried out at the customer's charge.
The repair can also be carried out by the customer himself with the help of this manual and the advises of the manufacturer (see sections 7 and 8).

1.5.3 Repairs

Repairing must be carried out in a laboratory fitted with the proper instruments. The technicians must have the suitable know-how in order to avoid instrument damage risks.
Spare parts (which list is given in the parts list) may be ordered either directly to the manufacturer or to GIGA INSTRUMENTATION.

1.5.4 Agents

All GIGA INSTRUMENTATION Agents may help you directly or not to insure an efficient service.

1.5.5 Modifications

In order to improve the quality and the performances of the GR 1300, GIGA INSTRUMENTATION may modify some of the electrical or mechanical parts of this instrument.
Moreover, mistakes may have been introduced in this manual. The chapter 9 (errata-modifications) contains the technical description of the modifications and the corrections for the mistakes.

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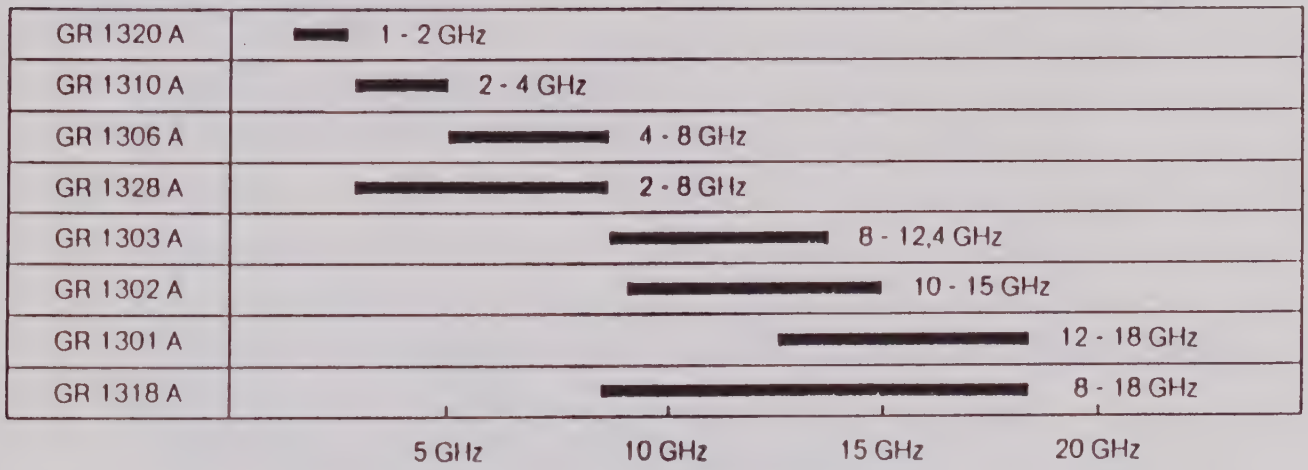
2. CHARACTERISTICS

2.1 SPECIFICATIONS

The GR 1300 is available in 8 standard versions covering the frequency band from 1 to 18 GHz. Different options can be added to the generator if details are given when placing the order (see paragraph 2.3).

FREQUENCY BANDS



FREQUENCY									OUTPUT LEVEL					
GR model	Frequency range	Accuracy	Resolution	STABILITY			SPECTRAL PURITY		Max without options	Min	ACCURACY		STABILITY	
				Temperature	over 5 mn (2)	10% of power supply	Signal-to-noise ratio (1)	Peak residual FM			Calibrator	Attenuator (3)	10 mn	+ 10% of power supply
	Ghz	± MHz	MHz	Mhz/°C	ppm	± kHz	- dBc/Hz	kHz	dBm	dB	± dB	N	± dB	± dB
1320 A	1-2	6	1	0,5	20	100	< 100	< 15	6	- 121	1	0.02	0.1	0 1
1310 A	2-4	12	1	0,5	20	100	< 100	< 15	8	- 121	1	0.02	0.1	0 1
1328 A	2-8	30	1	1	40	100	< 100	< 15	5	- 121	1	0.03	0.1	0 1
1306 A	4-8	24	1	1	30	100	< 100	< 15	7	- 121	1	0.03	0.1	0 1
1303 A	8-12,4	40	1	1	30	100	< 100	< 15	7	- 121	1	0.03	0.1	0 1
1318 A	8-18	50	1	2	50	100	< 100	< 15	2 (4)	- 121	1	0.05	0 1	0 1
1302 A	10-15	50	1	1	40	100	< 100	< 15	5	- 121	1	0.04	0.1	0 1
1301 A	12-18	50	1	1,5	50	100	< 100	< 15	5	- 121	1	0.05	0.1	0 1

(1) at 10-4 from the carrier. (2) At constant temperature and power supply. (3) ± (1dB + N dB/dB) except for GR 1328 A and GR 1318 A: ± (1.5dB + N dB/dB). (4) calibrator = - 10 dBm.

NOTE : Above-mentioned characteristics are given for operation after 30 minutes stabilization time at an ambient temperature of 23°C.

2.2 COMMON CHARACTERISTICS

Output characteristics

- 50-ohms impedance
- VSWR < 1.7
- Precision N-type connector
- Protection against overloads < 0.5 W average
- Low impedance 100mV/GHz rear output
- Rear output for modulating signal (TTL level)

HARMONICS, SUBHARMONICS

- 1 to 8 GHz : ≥ 12 dB, typ 15
- > 8 GHz : ≥ 15 dB, typ 18
- non harmonics : 60 dB

Modulation

* A1 Modulation

  Internal pulses :
  - repetition frequency of 10 µs to 99999 µs (10 Hz to 100 KHz)
  - delay < 2 µs to 10 ms
  - width : 50 ns (-0/+20 ns) to 1 ms
  - rise time + fall time < 30 ns
  - modulation depth : 80 dB (90 dB typically)

  Square-wave signal :
  - 10 µs to 99999 (delay steps)

  External triggering :
  - repetition frequency : 0 to 100 KHz
  - input pulse width : 0.1 µs to ∞
  - required rise and fall times : 1 µs
  - pulse characteristics are identical to that of internal modulation
  - level : ± (2 to 10V)
  - protection : ± 50V
  - polarity : positive or negative

  Synchronizing output :
  - width : < 1 µs
  - rise time / fall time : < 50 ns
  - TTL level

* FM Modulation

  A-FM input (rear panel) :
  - excursion : 100 MHz for 100 Hz FM
    40 MHz for 400 KHz FM

  Sensitivity : 0.3 to 0.5 MHz/mA

  B-ΔF input (front panel)
  - sensitivity : 0 to 5 MHz/V or
    0 to 10 MHz/V according to model
  - dynamic : -2V to +10V
  - BW : 0 to 10 KHz

* Power supply

100/120 - 220/240V ± 10 % (45 to 450 Hz)
Consumption : 40 to 80 VA according to model.

* Environment

0 to 50°C
Storage temperature : -10 to +55°C

* Size/weight of unit

- 440 x 88 x 342 mm
- weight : approx. 10 kg
- packaging : 600 x 560 x 230 mm

2.3 OPTIONS

Option 04 : Special modulator
This option ensures a modulation depth of 90 dB (100dB typically).
Additional insertion losses ≤2dB.

Option 05 : Assembly in a 19" rack
The handles of the generator are replaced by flanges allowing assembly in a 19" rack.

Option 06 : Supplementary Isolator
When placed at the source output, pulling of the oscillator is avoided.
Additional insertion losses ≤1dB.

* NOTE : This option is not available on the GR 1320 model.

Option 13 : Harmonic level : - 40dBC
Depending on the band covered by the generator, three assemblies are available for ensuring the rejection of harmonic level up to -40dBC.

. GR 1320 (1-2GHz), GR 1328 (2-8GHz).
Utilization of a source with an incorporated YIG filter.

. GR 1310 (2-4 GHz), GR 1306 (4-8 GHz), GR 1318 (8-18 GHz).
Utilization of 2 filters switchable by 2 relays and an isolator.
Additional insertion losses ≤3dB.

. GR 1303 (8-12.4 GHz), GR 1301 (12-18 GHz), GR 1302 (10-15 GHz).
Utilization of 1 filter and 1 isolator.
Additional insertion losses ≤2dB.

2.4 ACCESSORIES

External Display
The output frequency of the generator can be displayed on a high input impedance digital voltmeter (≥ 1 M Ω), 2V range, connected to the rear output 100mV/GHz.

Ramp Generator GW 1100
This case, directly powered by the rear socket 25 points, allows vobulation of the generator up to 50 or 100 MHz. The sweep signal can be synchronized by an exterior pulse applied to the generator.

Sweep oscillator GW 1300
A special saw-tooth generator can be connected directly to the generator so that it can be used as a vobulator while keeping at the same time the most important characteristics.
This oscillator has independent controls from the beginning of the sweep to the end (F1 - F2), frequency markers with adjustable amplitude and/or intensity. The demultiplication of controls is proportional to the width adjusted by F1 - F2. This ensures the same fine adjustment and stability whatever the difference of frequency between F1 and F2. Five fixed frequencies can also be programmed.

Adaptation for IEEE 488 and IEC 625 programmation
The GR 1300 generator can be programmed in IEEE by means of the GW 2300A interface. This accessory is fixed to the rear of the generator without modifying its vobulation or generator performances.
One or two 16 bits converters allow the programming of the frequency and the level with a 65535 bits resolution or the frequency of two generators. Internal straps allow the required utilization to be fixed.

GW 1357 adaptor with 0/10V output
This accessory allows the YIG oscillator of the generator to be driven in order to adapt it both to the counters-synchronizers and to the network analyzers.

NOTE : In these applications the spectral purity of the generator depends on the signal supplied by the synchronizer or analyzer.

Portable case in black wood
Locations are provided for a mains cable and a 50 ΩN cable.

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3. OPERATION

3.1. INSTALLATION

3.1.1 Bench Operation

A stand can be used in order to separate the front of the generator from the work surface.

3.1.2 Rack mounting

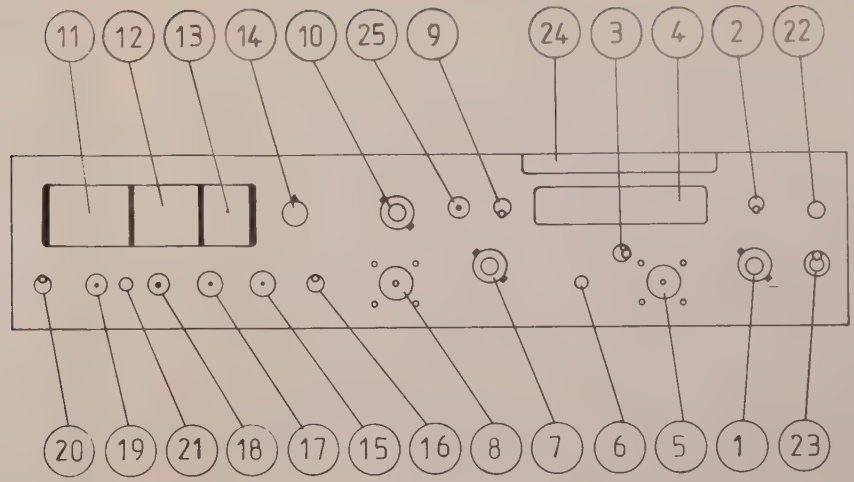
When the generator is fitted with the mounting flanges fix it in the rack and ensure that at least the rear of the generator rests on the stand. Room temperature around the generator should not exceed 50°C when the generator is running. A forced ventilation should be provided in the rack.

3.1.3 Power

Before connecting the generator to the power supply, make sure that it is set to the voltage of the power source.
A power cord which grounds the instrument is provided. Make sure that this connection is working when the cord is plugged into the mains socket.

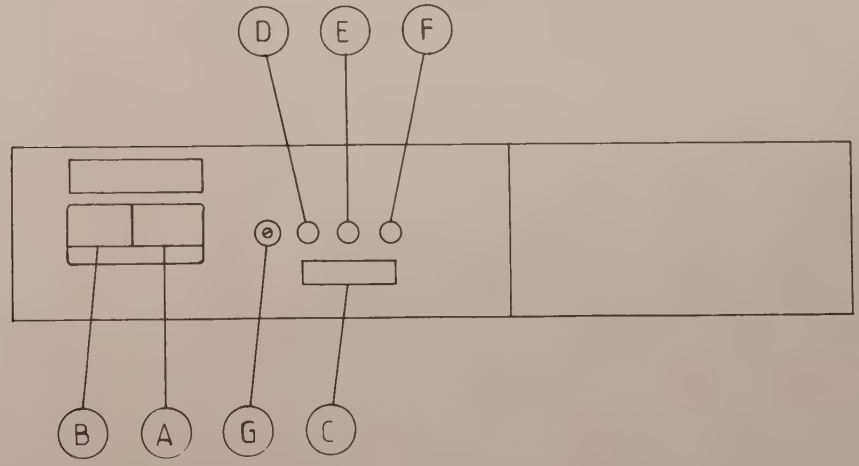
3.1.4 Fuses

A time-delayed fuse is used, for 220/240V mains a 500mA fuse is required, for 100/120V a 1A fuse is required.



FACE AVANT

FRONT PANEL



FACE ARRIERE

REAR PANEL

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COMMUNICATION, REPRODUCTION ET UTILISATION INTERDITES

Édition :

Code

COMMANDES ET PRISES

CONTROLS AND CONNECTORS

3.2. CONTROLS AND CONNECTIONS

3.2.1 Front panel

① Frequency selector : sets the frequency by 15 steps of 7% of the generator band and 10 turn fine adjustment.

② Frequency control switch

- "MANUAL" : Utilization as a generator or a narrow band sweep oscillator with Δ F input.
- "EXT AUTO" : Utilization as a wide band sweep oscillator with GW 1300 base.

③ Display switch : "FREQUENCY" or "LEVEL", read as in ④

④ Digital readout giving :

- Output frequency in "GHz" of the generator in "CW" or "MODULATED MODE" (③ is on "FREQUENCY" and ② depressed).
- The frequency in "MHz" of the Δ F during a narrow band sweep (⑨ on "MHz", ⑳ in the up position).
- The output level of the generator (③ on "LEVEL"). The last digit is then used as an electronic galvanometer for 0 dBm calibration ("OUTPUT" ⑤ is connected to "INPUT" ⑧).
- Segment display test when ⑩ is on "0".

⑤ RF output connector, N type - 50 ohms.

⑥ RF indicator lights up when RF signal, modulated or not, is present at "OUTPUT" ⑤.

⑦ Output level control by 10 dB steps up to 110 dB and fine setting over 11 dB (switch concentric potentiometer). The reading is directly displayed in dB if ③ is on "LEVEL".

⑧ Input to 0 dBm calibrator, N connector - 50 ohms (-10dBm for the GR 1318/1328).

⑨ Frequency display switch

- RF output in "GHz"
- in "MHz" reading of a Δ F due to voltage applied in and current applied in Ⓕ.

⑩ Function switch

1° - "CW" : non modulated signal which can be calibred at 0 dBm and synchronized externally by the ΔF (input ⑱).

2° - "EXT.MOD" : In pulse mode, external generator connected in ⑮ with ⑯ on ⌐ or on ¬.

3° - "0" : RF attenuated to maximum by the internal attenuator and the modulator.

4° - "INT.MOD" : Internal pulses which are adjustable by ⑪, ⑫, ⑬ and ⑭ if ⑯ is in the central position, ⑫, ⑬ and ⑭ if ⑯ is on ⌐ or on ¬.

5° - "⎍⎍.INT" : Ajustment only by ⑪.

⑪ "REPETITION" of the internal pulse, adjustable from 10 to 99 999 us, disconnected when ⑯ is not in the central position.

⑫ "DELAY" of the internal pulse in relation to the synchronization ("OUTPUT" ⑰ adjustable from 1 to 9999 us).

⑬ "WIDTH" of the pulse adjustable from 0 to 999 us.

⑭ Fine adjustment of the "WIDTH" of the pulse from 50ns to 1µs this value being added to ⑬.
Note that the repetition must always be at least 1 microsecond higher than the width plus the delay.

⑮ External signal input for modulation if ⑩ is on "EXT.MOD" or for trigger input if ⑩ is on "INT.MOD".

⑯ Trigger input : internal (central position) or external positive (up position) or negative (down position) of the internal pulse generator.

⑰ Pulse output of the "SYNCHRONIZATION" of the modulation (TTL < 1 us).

⑱ Adjustment of the ΔF input ⑲ allowing a setting of 1 to 50 or 100 MHz.

⑲ Control of ΔF input for the narrow band sweep with the GW 1300 base and for utilization with the GW 1100 base.

⑳ Δ F switch pushed up validates the Δ F input.

㉑ Δ F indicator lights up when the ΔF switch is in the up position.

㉒ Power indicator lights up when the generator is connected to the mains and the switch ㉓ is on "ON".

㉓ Power switch : on "ON" the generator is switched on and on "OFF" switched off.

㉔ Signal label indicating :

- the reference of the generator (GR 1303 A for example)
- the frequency band (8 - 12.4 GHz for example).

㉕ "SET LEVEL" potentiometer : calibration of the level to 0 dBm if ⑤ is connected in ⑧ and ⑩ on "CW".

3.2.2 Rear panel

Ⓐ Power selector 100, 120, 220 or 240V and fuse carrier

Ⓑ Power cord socket

Ⓒ Multi-pin interface connector for sweep accessory

Ⓓ Output connector of the internal modulator's control signal in TTL level.

Ⓕ Current input for a frequency modulation or a synchronization. It is directly linked to the auxiliary winding of the YIG oscillator, via a serial resistor of 4.7 ohms, allowing the ΔF to be displayed directly in MHz.

Ⓖ Control of the maximum sweeping speed.

3.3. FREQUENCY CONTROL

3.3.1. Manual control of RF frequency

- Any position of the "FUNCTIONS" switch except "0".
- Depress the frequency control switch (2) on to "MANUAL", the display switch (9) on to "GHz" and the inverter (3) on to "FREQUENCY".
- Adjust the output frequency (1), first by the steps control, then by the progressive control which covers a frequency band slightly higher than the gap between two steps.
- The frequency gap between two steps is around 7% of the total width of the generator band.
- When moving from one step to another, the frequency is displaced on the top of the band in order to diminish the hysteresis effect and thereby to obtain an improved precision in the operate frequency display. It is therefore advisable to this control at least once when switching on the generator.
- If the generator is connected to the sweep oscillator turn the "MODE" switch on to "MANUAL" in order to eliminate, among other things, the signals for the return of the saw tooth and markers.
  The base must also be fed from the mains so that the display received its measurement orders.

3.3.2 Automatic control of RF frequency (sweeping)

- "FUNCTIONS" switch on "CW".
- Depress the mains switches of the sweep unit and of the generator onto "OFF" and interconnect the two instruments by the interface cable of the GR 1300 A ---> GW 1300.
- Depress the inverter of the frequency control (2) onto "EXT.AUTO". The two manual control buttons are no longer active. Only a power supply of between 0 to 2.5V applied to the pin (4) of the interface connector, will control the frequency from the bottom to the top of the band.
- Turn the GW 1300 display switch on to WF, M1 and M2. The sweeping is adjusted within the pre-adjusted limits, the M1 and M2 markers are usable both in amplitude and in intensity and their frequency can be indicated by an external frequency meter connected as described in the sweep oscillators manual.
- In this form of operation, in "GHz", the generator's digital readout always indicates the frequency at the start of the sweep. In "MHz", the WF, M1 and M2 parameters will be displayed in relation to the start frequency shown in "GHz".

. In order to cut the RF signal giving the return of the saw-tooth, the 0/+5V output of the GW 1300 oscillator must be connected to the input of the "EXT.TRIG" of the generator and the "FUNCTIONS" switch must be turned onto "EXT.MOD". If the operations phase is inversed the GW 1300 oscillator should be opened and the R D S + strap should be placed on the R D S - .

3.3.3. Narrow band sweeping

With the GW 1300 model

This type of sweeping is recommended for analyzing narrow band circuits. This allows high stability of the central frequency of the sweeping as well as much finer control of the band width.

Depress the inventer of the frequency control onto "MANUAL" and switch up the ΔF inverter.

Ensure that the ΔF indicator lights up.

Connect the output signal D.S (0 to 10V) of the oscillator to the ΔF input of the generator. If the amplitude of the saw-tooth is fixed, adjust the sweep oscillator with the sensitivity control.

The saw-tooth being on minimum, adjust the start frequency with the two manual controls of the generator (⑨ on "GHz").

With the saw tooth generator GW 1100 model (see the following diagram)

It should be connected to multi-pin plug of the interface of the generator for power supply.

The width control being on maximum and the inverter ⑨ on "MHz", adjust the band width by the ΔF sensitivity control of the generator ⑱, the reading being made in "MHz" on the digital readout ④.

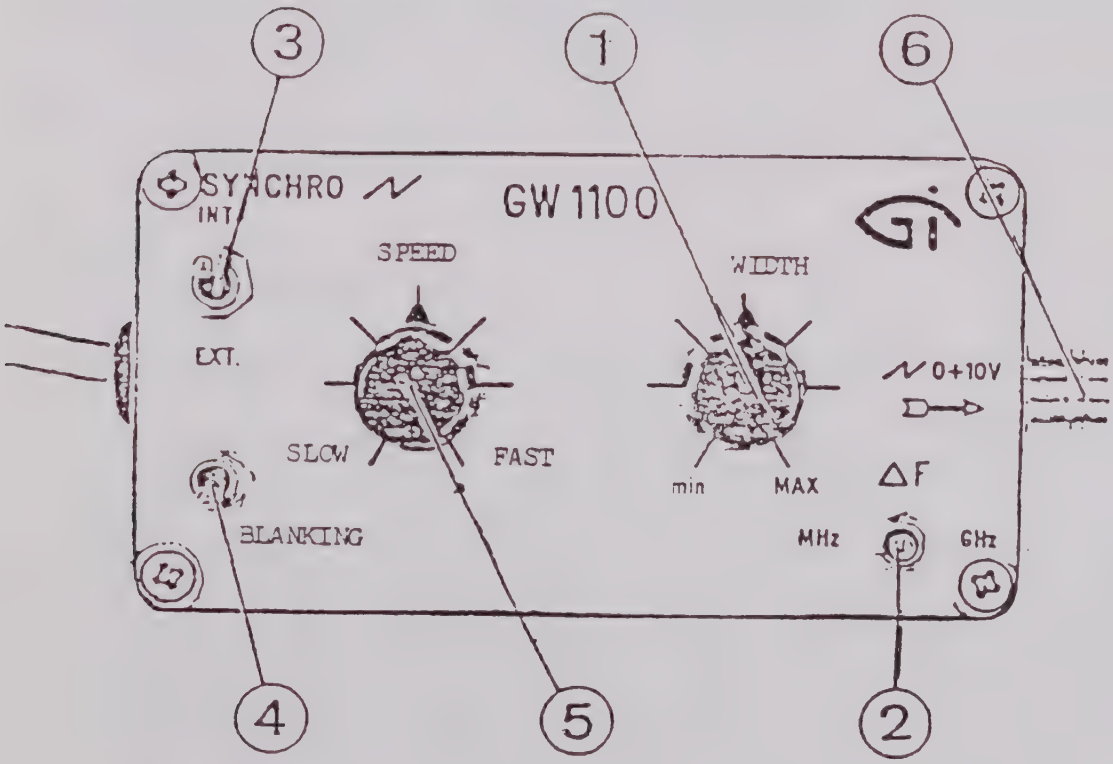
This width can then be adjusted as required between 0 and the maximum imposed previously with the controls ① and the reading in "GHz" on the digital readout ④ when the inverter ⑨ is lowered.

The sweeping frequency can be free ("INT" position) or it can be synchronized ("EXT" position) by a signal applied to the generator's trigger input, the polarity being correctly positioned. In both cases the sweeping will only be made if the "MHz/GHz" inverter of the GW 1100 case is in the central position Δ F. The Δ F switch (20) must be switched up to link the output of the Δ F amplifier to the YIG oscillator's auxiliary coil.

Besides this, during the return phase of the sweep the RF return can be diminished, in the "ERASE" position of the inverter of the visual screen.

A speed control on the GW 1100 case allows a good presentation of the RF sweeping signal.

A BNC plug on the GW 1100 case gives in output the signal of a constant amplitude sweep (0 to + 10V) for the visualisation.



(1) Adjustment of the sweep width between 0 and a maximum defined by the generator's sensitivity adjustment.

(2) Operation inverter :

. "MHz" for adjustment of the sweep width

. " Δ F" for sweeping

. "GHz" for adjustment of the frequency of the start of the sweep.

(3) Trigger of the sweep :

. "INT" free repetition of the sweep

. "EXT" repetition of the sweep synchronized with a signal applied to the trigger input of the generator.

(4) Erase, in this position the RF signal is diminished during the return phase of the sweep.

(5) Adjustment of the sweep's speed or of the slope of the sweep's signal during the active phase.

(6) 0 to 10V output of the sweep's signal for the visualisation.

3.3.4. Synchronization

. "FUNCTIONS" switch on "CW" and (2) on "MANUAL".

. In order to obtain a very stable reference frequency, it is possible to stabilize the generator by a phase loop using an external synchronizer.
At the generator's output, take the RF signal and inject it into the counter's input. Connect the "LOCK-OUT" output of the counter to the "FM" input on the rear panel of the generator, lock the signal and control the frequency gap on the digital readout (4) when (9) is on "MHz" and (3) on "FREQUENCY". It is advisable to bring this gap back to 0 by the manual frequency control (1) in order to minimize the noise made by synchronization loop.

3.4. LEVEL CONTROL

3.4.1. Calibration in "dBm"

In order to obtain an output signal calibrated in dBm at the extremity of the cable normally used :

- the "FUNCTIONS" switch must be positioned on "CW"
- the frequency control (1) must be adjusted for the required utilization.
- the "LEVEL/FREQUENCY" inverter must be lowered onto "LEVEL" and the attenuator control (7) must be adjusted to read 00.0 dBm (see note 3 below).
- the output of the generator (5) must be connected to the input of the calibrator (8) by the cable normally used (See note 1 below).
- the "LEVEL" potentiometer (25) must be adjusted to light up the central segment of the right digital readout (see note 2 below).
- the same cable must be connected to the input of the device under test. The digital readout (on "LEVEL" position) will display directly in dBm the signal level (adjusted by (7)).

NOTE 1 : In practice, the cable losses must not exceed the difference between 0 dBm and the minimum level of output. The attenuator is calibrated for cable losses up to 3 dB.

NOTE 2 : Digital readout of the 0dBm calibration. In the level readout a special dispositive allows three segments of the right readout to be used as an electronic galvanometer.

Four cases can be presented :

- Lower bar segment lights up when the RF signal at the input of the calibrator is lower than 0dBm. If the signal is zero or very weak, this segment does not light up.

- No bar segment lights up when the RF signal at the input of the calibrator is near 0dBm by the higher or lower value.

- Middle bar segment lights up when the RF signal at the input of the calibrator is equal to 0dBm or 1mW/50ohms.

- Top bar segment lights up when the RF signal at the input at the calibrator is much higher than 0 dBm.

NOTE 3 : For GR 1318 generator model, calibration is made at - 10 dBm. The central bar segment at the right digital readout lights up at this value.

3.4.2. Attenuation

The output level can only be calibrated in dBm if the calibration operation, as described in the last paragraph, is carried out previously. The attenuation is made in 2 phases for any position of the "FUNCTIONS"switch.

- Steps : 11 steps of 10 dB allowing attenuation up to 110 dB.

- Variable : a potentiometer installed in the center of the steps control allows progressive attenuation of the signal between 0 and 11dB. This attenuation is added to the value of the steps. The resulting attenuation is displayed directly on the readout for the "LEVEL" position of the "LEVEL/FREQUENCY" toggle switch.

- For sweeping with the GW 1300 oscillator, the readout is controlled at each sweep when the measure led lights up. For slow sweeps, you must therefore wait at least one cycle before reading the attenuation value.

3.4.3. Off RF "0"

In the 0 position at the "FUNCTIONS" switch and in any position of the attenuation switch, the signal is attenuated by at least 100dB, by switching on two 40dB cells of the step attenuator and by switching off the modulateur.
Equally in this position all the segments of the display digits light up so that good working order can be checked.

3.5. MODULATIONS

In all cases, the RF led situated near the output socket indicates (when lit-up) that the RF is flowing through the modulator at least for the duration of 1 pulse. For repetition rates lower than 20 Hz, the light flashes.

3.5.1. Internal square wave modulation

- "FUNCTIONS" switch on " ⊓⊔ INT" position.

- Square RF modulation for a repetition frequency between 10Hz and 1 MHz. This frequency is controlled by adjusting the repetition time in microseconds between 99999 and 1 (thumbwheel switch (11)) respectively.

. At the beginning of each repetition period the synchronization pulse is present at a TTL level.

. This mode of function is not possible with external trigerring and therefore the trigger inverter (16) is not active.

3.5.2. Internal pulse modulation

. "FUNCTIONS" switch on "INT.MOD"position.

Internal trigger

. Toggle switch (16) in the central position.

. Adjust repetition time in µs with (11) (series of 2 - 99999 µs).

. Adjust delay time in µs with (12) (<2µs to 9999 µs). The delay is the time elapsed between the start of the synchronization pulse in (17) and the start of the RF pulse in (5), parasitic propagation time being not included.

. Adjust the width time with (13) for multiples of µs and with (14) for fractions of µs. The effective width of the RF pulse is the sum of these two ajustments and will be in the range 50ns (-0, +20ns) to 1ms. The small switching time of the modulator is nos included.

NOTE : To respect the modulation characteristics displayed, the repetition time must always be higher by at least one us than the sum of the displayed times (delay and width).

External trigger

. Apply the trigger signal in (15) and select its polarity by the inverter (16) (repetition frequency between 0 and 500 KHz). The repetition adjustments are now inactive.

. Proceed as for the internal trigger for adjustment of delay and width following the same Note.

3.5.3. External modulation

- "FUNCTIONS" switch on "EXT.MOD" position
- Apply the modulation signal on (15) and select its polarity by the toggle switch (16). The RF signal is modulated according to the characteristics of the input signal, but within the switching characteristics of the modulator.
- In this case, all the adjustments of the pulse generator are inactive.
- Possibility of modulation with a very narrow external pulse with modification on the 502512 board (see 7.6.3).

3.6. REAR CONNECTORS AND CONTROLS

3.6.1. 100mV/GHz output

Located at the rear panel this socket allows the numerical voltmeter to be connected for distance readout of the generator's output frequency.

3.6.2. ⎍ Output

Located at the rear panel this socket is connected to the modulator's input. It gives the modulator's control signal (TTL LEVEL) which corresponds to the detected RF, switching time being not included.

3.6.3. FM input

This socket is directly connected to the winding of the frequency control with 4.7 Ω in series and when the " F" toggle switch located on the front panel is switched down (I max ± 500mA).

3.6.4. Maximum speed

This adjustment located at the rear panel allows adjustment of the maximum sweep speed when the generator is connected to a GW 1300 sweep oscillator.

3.6.5. Multi-pin connector

This connector can supply the GW 1100 sweep oscillator case, receive orders from a GW 1300 sweep oscillator, supply certain accessories or be used for the control of certain modes of particular functions.

N° of PINS	DESIGNATION
1	Power reference +2,5 V
2	N.C
3	Ground reference 0V
4	Frequency control "EXT AUTO" input
5	Saw tooth input
6	100mV/GHz or 10 mV/MHz output
7	Readout input for "FREQUENCY" position of (3)
8	"SPEED" adjustment input
9	Readout measure control (_┌/TTL)
10	N.C
11	YIG supply filter control input
12	Current input of the GW 1300 oscillator markers
13	On/off RF control input
14	General power supply ground
15	N.C
16	+ 5V supply output
17	N.C
18	+ 15V supply output
19	N.C
20	- 15V supply output
21	Direct input on PIN diode zero setting
22	Definition of the readout control input
23	DS synchro pulse for GW 1100 output
24	Manual control 0 to 2.5V output
25	Sweep signal input (idem connector (19))

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4 APPLICATIONS

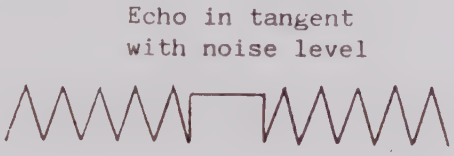
4.1 GENERAL INFORMATION

The GR 1300 series of microwave pulse modulated generators allow radar transponders (civil or military) to be tested in the 1 to 18 GHz range. The following measurements can be taken :

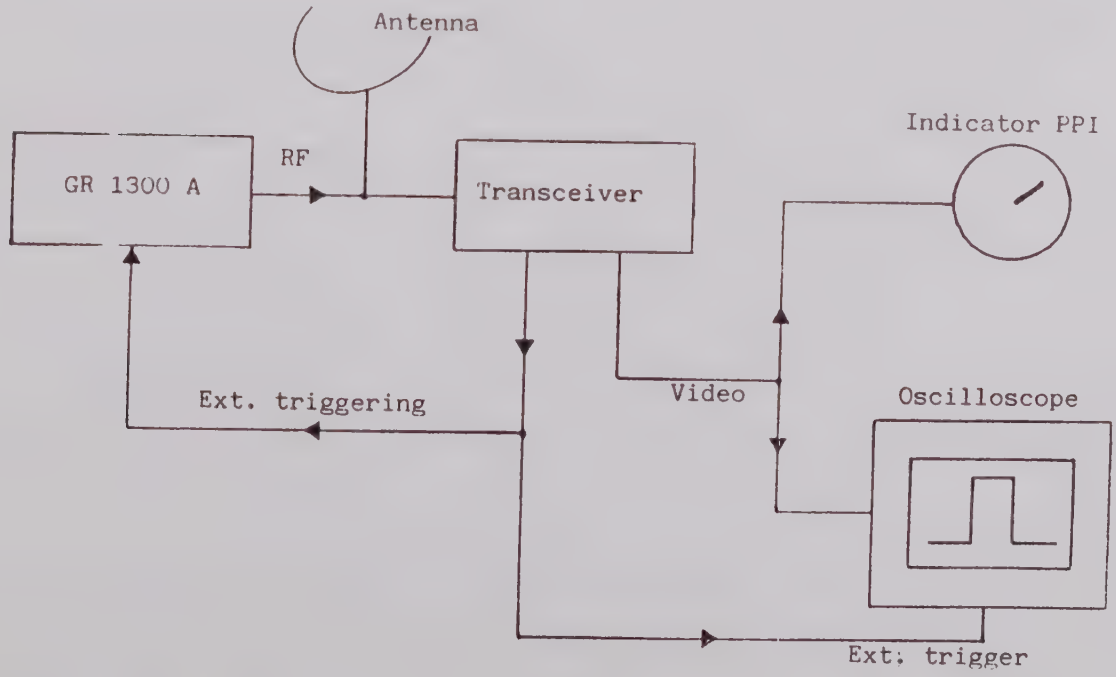
- receiver sensitivity
- pass band measurement
- range simulation

4.2 RADAR SENSITIVITY

Due to the high accuracy of GR 1300 generator, this very important feature can be checked thereby avoiding its degradation, seen on the screen as a range loss.
The measurement is taken by checking with the oscilloscope at what level the pulse is slightly above the receiver noise.



The simulation of high resolution radars is facilitated by the narrow width of the pulse (50 ns minimum), the high level dynamics and the compensation of the measurement cable.



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5 PREPARATION FOR USE

5.1 MECHANICAL INSPECTION

The dispatching of the material is carefully prepared to avoid any damage during transport. With this intention, the generator is cushioned by foam inside a protective container.
When taking delivery it is recommended that the generator be inspected for any mechanical damage due to transport. The warranty contract can be invoked if any defect is found.

5.2 CONNECTION TO THE MAINS

The generator's electrical circuits require a standard power source (100V, 120V, 220V, rms) supplied by general electricity mains.
The maximum variation tolerated is from ± 10 % of the normal voltage. The frequency of the input signal must be between 45 Hz and 450 Hz. Power consumption is between 40 and 80VA depending on the model.

5.2.1 Incoming inspection

Caution : the inspections required in this paragraph must be carried out before connection to the mains.

5.2.1.1 Power input

On the rear panel the input consists of a standard socket which incorporates the voltage selector board and the protection fuse.
When the selector board is in the correct position, the selected voltage (100, 120, 220 or 240 Volts) appears in the module window.
Check the fuse to make sure that it is the correct rating for the line voltage, i.e. :

- 1A time-delay fuse for line voltage of 100V or 120V RMS
- 500 mA time-delay fuse for line voltage of 220V or 240V RMS.

5.2.1.2 Earth connection

The cable supplied with the generator is a standard 3 pin cable which links the metal frame of the instrument to the earth plug. It is important to check that this connection is working before switching on the instrument.

5.2.2 Power up

Plug the cable into the input socket (3 pins) and plug the other end into the mains. Switch on the instrument with the toggle switch located on the front panel and check that the led lights up indicating that the generator is switched on.

5.3 ENVIRONMENT

The generator may be operated in room temperatures between 0 and + 50°C, the technical characteristics fluctuating slightly within this temperature range.

5.4 STORAGE

When not in use the instrument must be stored in a dry environment with a temperature between -10 and +55°C.

5.5 RACK MOUNTING

The generator can be fitted with an adaptation to allow installation in a 19" rack if requested when placing the order (option 5).

If the instrument is not equipped with mounting flanges, it is possible to mount them in the following way :

- remove the boards located at the rear ends of each lateral mount
- remove the top and bottom cover of the generator and the trim strips on the sides
- rest the instrument vertically on the lateral mounts and remove the opposite side by taking out all the screws.

Remove the stand and the handle and fix the handle to the new stand.

- put into place and fix the new stand
- reassemble the adapted side and proceed in the same way for the opposite side
- install the instrument in the rack respecting operating conditions (see 3.1.2).

5.6 INCOMING INSPECTION TEST

The incoming inspection test allows a summary verification of the working order of the generator without using external measurement instruments.
For a more extensive test, refer to Chapter 6. The display panel shows numerical information concerning the level and the frequency. When switched on check that the frequency control toggle switch is on the "MANUAL" position in order to validate the individual tests of the generator.

5.6.1 Frequency tests

- Switch the functions switch onto "CW", the readout selector on "FREQUENCY" and the frequency selector readout onto "GHz".

- Check that the RF led is lit up.

- Check that the frequency readout contains 4 figures for frequencies lower than 10 GHz and 5 figures for frequencies higher than 10 GHz with a decimal point followed by the GHz unity.

Examples : 8.500 GHz, 11.253 GHz

- Turn the frequency switch (15 steps) and check with the digital readout that each step corresponds to 7% of the total generator band.

Example : For a GR 1310A, 2-4 GHz, the gap between each step is $\frac{7 \times (4-2)}{100} = 0.14$ GHz

- Turn the frequency vernier and check that the total excursion covers the frequency gap between two steps of the switch.

5.6.2 Level test

- Position the readout selector onto "LEVEL" ; the functions switch stays on "CW"

- Check that the RF light stays on.

- Check that the level readout contains 3 figures for an attenuation lower than 100 dB and 4 figures for an attenuation higher than 100 dB with a decimal point, preceeded by the sign and followed by the dBm unity.

Example : -105.8 dBm, -41.0 dBm

- Turn the level switch (11 steps) and check with the digital readout that each step corresponds to a progression of 10 dB.

- Turn the level adjustment potentiometer and check that its dynamic is 11 dB.

- Check that the total dynamic of the instrument extends from 121 dBm to 0 dBm.

5.6.3 Modulation test

- Switch the functions switch onto "INT.MOD" and the trigger toggle switch onto "INT.TRIG".

- Adjust the repetition value to 0 µs with the thumbwheels and check that the RF light is off.

- Switch the repetition value onto 2 µs and check that the RF light is on.

- Adjust the repetition value to 99999 µs and check that the RF light flashes.

5.7 PACKAGING

If the instrument is to be redispatched, it is highly recommended that the original packaging be used for greater protection during transport.

If the instrument has any defects, please give details on the dispatch bill.

For further information on the warranty and repairs, please refer to Chapter 1 of the manual.

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6 PERFORMANCE TESTS AND CALIBRATION

The aim of this chapter is to describe the procedures of testing the performances of the GR 1300 in such a way as to guarantee the performances and good working order when a periodical calibration or maintenance service takes place.

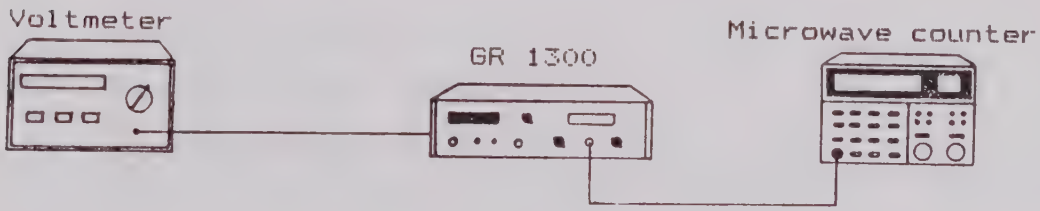
Equipment required

- 4 ½ digit voltmeter : ± 0.5 to 10-4 accuracy
- microwave counter in the generator range : 1 to 5.10-5 accuracy
- spectrum analyzer in the generator range : ± 0.2 dB accuracy
- 0-500 KHz function generator
- 2 x 10 MHz oscilloscope
- measurement detector
- 50 Ohms BNC load
- BNC cables
- N cable
- N - SMA adapter

6.1 PERFORMANCE TEST

6.1.1 Frequency accuracy

Frequency accuracy is checked by connecting a microwave counter to the RF output of the generator. It is also possible to confirm the 100MV/GHz variation by connecting a digital voltmeter 4 ½ digit to the BNC 100mV/GHz socket located on the rear panel.



Front panel features

- Frequency control on "MANUAL"
- Functions switch on "CW"
- Minimal attenuation (0dB)
- Set potentiometer on right-hand block (minimal attenuation)
- Readout selectors on "FREQUENCY" and "GHz"

Take 10 to 15 measurement points on the total frequency band and check it with the table below :

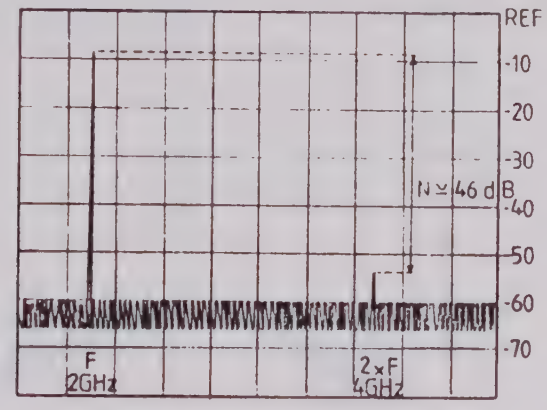
GR 1300 MODEL	FREQUENCY RANGE (GHz)	FREQUENCY ACCURACY (± MHz)
1320 A	1 - 2	6
1310 A	2 - 4	12
1328 A	2 - 8	40
1308 A	4 - 8	24
1303 A	8 - 12.4	50
1318 A	8 - 18	50
1302 A	10 - 15	50
1301 A	12 - 18	50

6.1.2 Harmonic level (Option 13)

The front panel features are identical to those above. The harmonic level 2 is checked by connecting a spectrum analyzer to the RF output of the generator.

A frequency range is selected on the spectrum analyzer so that the frequency chosen F and its second harmonic (2xF) can be seen at the same time. The difference in amplitude between the two lines represents the harmonic level.

Example :



Proceed as in the previous paragraph and check that the harmonic level is -40 dBc on the total frequency range for the generators fitted with Option 13.

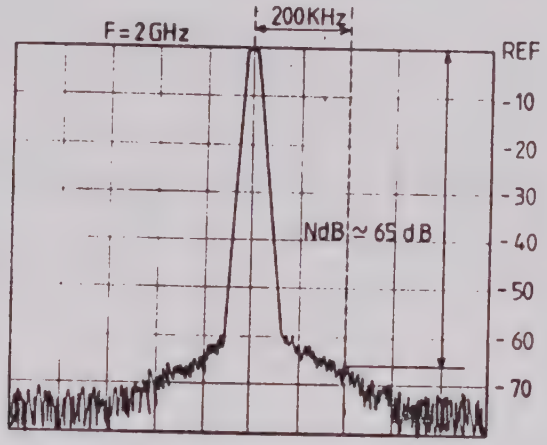
6.1.3 Signal to noise ratio (>100 dB/Hz)

The front panel features are identical to those described in the previous paragraph.
The spectrum analyzer connected to the RF output of the generator optimizes the adjustment of the principle functions of the analyzer (sweep speed, resolution, scan width, etc..) in order to present the signal (frequency = F) in the center of the screen and to take the measurement at 10-4 of the carrier.

NOTE : As noise measurement is expressed in dB/Hz, the IF band width in which the measurement is made should be taken into account.

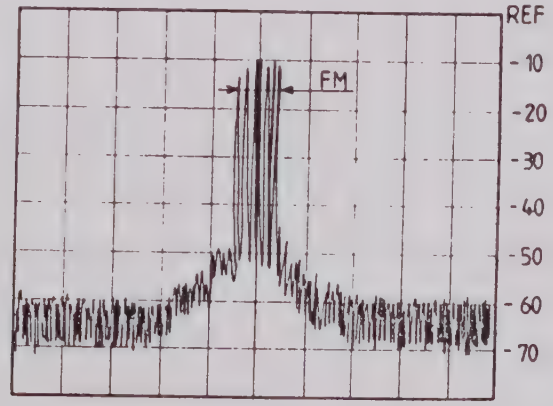
Example : If the noise measurement is made with a 10 KHz bandwidth, 40 dB (10 log 104 = 40) must be added. Thus for the present case the signal to noise ratio is :

65 dB + 40 dB = 105 dB/Hz



6.1.4 FM Residual (<15 KHz)

Measurement conditions and the front panel settings are identical to those described in the previous paragraph.
To check this characteristic, the width of the sweep must be brought back to 10 KHz so that the signal is presented in the center of the screen.



Take 10 measurement points on the total frequency range and check this characteristic, the FM residual being equal to the sum of the FM spectrum multiplied by the sweep width/division selected on the analyzer (10 KHz/DIV).

6.1.5 Frequency stability

Measurements for harmonic level, signal to noise ratio and FM residual having been previously taken with the spectrum analyzer, the two instruments are sufficiently warmed up after five minutes to check the frequency stability (first memorization of the signal and five minutes afterwards verification of the drift).
Take the measurement in the center of the frequency range and check against the table below :

GR 1300 MODEL	FREQUENCY RANGE (GHz)	STABILITY OVER 5 mn (ppm)
1320 A	1 - 2	20
1310 A	2 - 4	20
1328 A	2 - 8	40
1308 A	4 - 8	30
1303 A	8 - 12.4	30
1318 A	8 - 18	50
1302 A	10 - 15	40
1301 A	12 - 18	50

NOTE : If a spectrum analyzer with a memory is not available, the measurements can be taken with a microwave counter with a 5 minutes interval.

6.1.6 Level test

6.1.6.1 Output power accuracy

The output power of the generator is checked by connecting a powermeter to the RF output of the instrument.

The front panel settings are identical to those described in the previous paragraphs.
Sweep all the frequency range and read the output power, checking the readings with the table below.

GR 1300 MODEL	FREQUENCY RANGE (GHz)	MAXIMUM LEVEL ≥ (dBm)
1320 A	1 - 2	5
1310 A	2 - 4	5
1328 A	2 - 8	1
1308 A	4 - 8	6
1303 A	8 - 12.4	7
1318 A	8 - 18	0
1302 A	10 - 15	4
1301 A	12 - 18	4

6.1.6.2 Attenuation accuracy (± 1 dB)

Accuracy of the variable attenuator

Use the same procedures as describe in the previous paragraph.
The front panel settings are still identical (minimal attenuation) : adjust the level potentiometer so that 0 dBm is displayed on the generator's readout (readout selector on "LEVEL").
Adjust the set level potentiometer to read 0 dBm on the power meter.
Adjust the level potentiometer to read -10 dBm on the powermeter and note the variation with the value read on the generator's readout.
Check the attenuation accuracy by taking 10 to 15 points on the total frequency range.

Accuracy of the step attenuator

Proceed in the same way to check the step attenuator, but use a spectrum analyzer instead of a milliwattmeter.
Check the accuracy of each step of the attenuator from -10 to -110 dB.

NOTE : For the GR 1318 and GR 1328 generator models, the accuracy is ± 2 dB.

6.1.6.3 Calibrator accuracy (± 1 dB)

The internal calibrator allows compensation for losses caused by the connecting cable in order to obtain 0 dBm at the end of the cable or -10 dBm for models GR 1318/1328 (see 3.4.1).
The front panel settings are still identical (minimal attenuation). Connect the RF output of the generator to the "0 dBm CAL" input using the utilization cable.
Adjust the set level potentiometer to light up the center segment of the right-hand readout.
Disconnect the cable from the "0 dBm CAL" input and measure the power output at each end of the cable with the powermeter.
Proceed in the same way on the total frequency range (10 measuring points) being careful to readjust the calibrator (with the set level potentiometer) output before each measurement.
Check that the real output level at the end of the cable is between -1 and +1 dBm.

6.1.7 Modulation

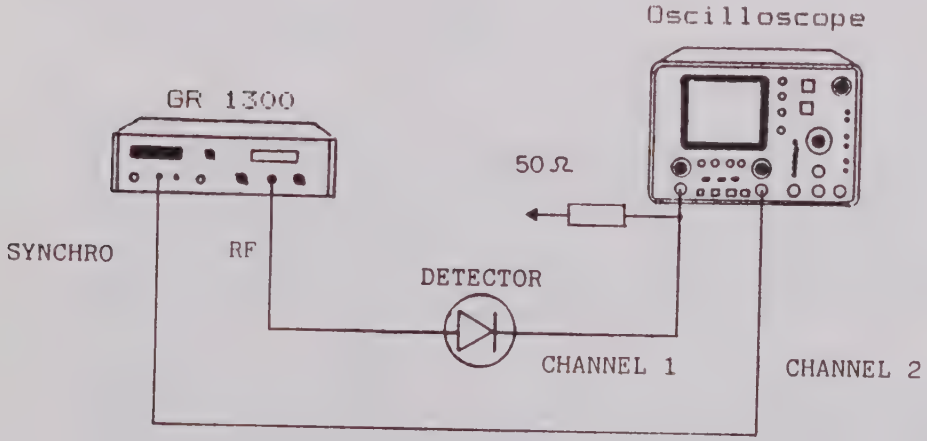
6.1.7.1 Modulation depth

The modulation depth is checked by connecting the spectrum analyzer to the RF output of the generator.

The front panel settings are identical. Adjust the sweep width of the spectrum analyzer to 100 KHz per division so that the peak thus formed can be seen.
Turn the functions switch onto "EXT.MOD" and measure the amplitude of the new peak. The modulation depth is equal to the difference in amplitude between the two peaks.
Take 10 measuring points on the total frequency band and check that the modulation depth is 80 dB (or 90 dB for instruments fitted with Option 4).

6.1.7.2 Internal pulse test

In order to observe the characteristics of the modulating signal carry out the following assembly :



Turn the functions switch onto "INT.MOD" with the attenuation still on minimum.

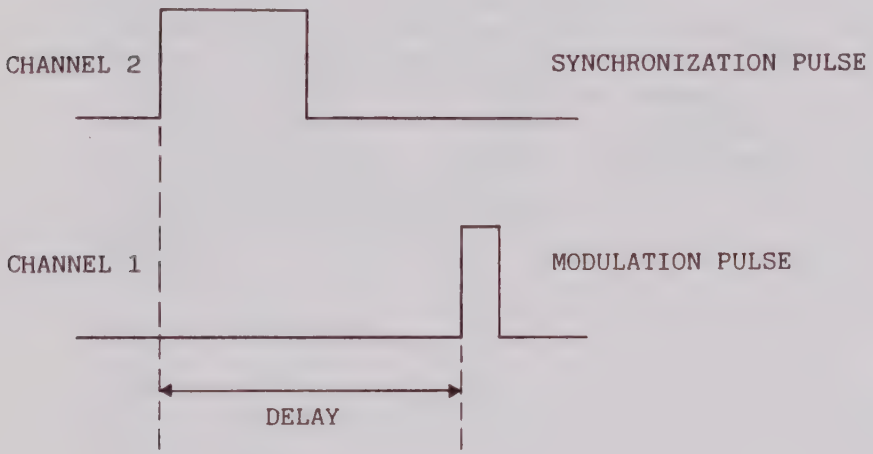
NOTE : For the following manipulations, take the precaution of having a repetition time higher than delay time + pulse width.

- Pulse width test

Adjust repetition to 10 µs, the delay and the width to 0 µs with the thumbwheels switches.
Check on channel 1 of the oscilloscope the continuous adjustment of the width (with the potentiometer), extreme values being :
50ns (-0, + 20ns) minimum and 1 µs maximum.
Check that the up time added to the down time is less than 30 ns.
Check the microsecond unities, tenths and hundredths are working with the width thumbwheels, being careful to increase repetition value in consequence (see note above).

- Delay test

In order to determine delay value, superpose channel 1 and 2 of the oscilloscope.

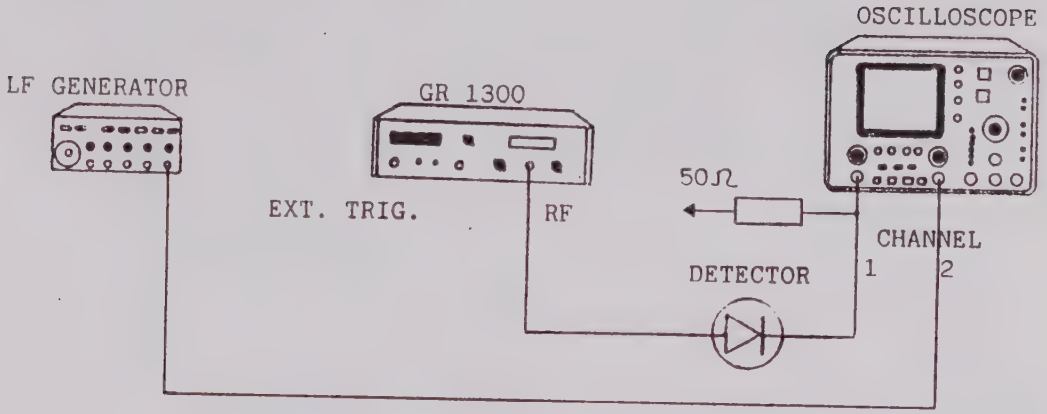


The delay is equal to the time passed between the beginning of the synchro pulse and the beginning of the modulation pulse.
Turn the delay adjustment thumbwheels switches to check that the microsecond unities, tenths, hundredths and thousandths are working.

- Repetition test

Switch the functions switch onto "INT ⌐└─┘└ " and check on the oscilloscope's screen the repetition value with the thumbwheels switches.

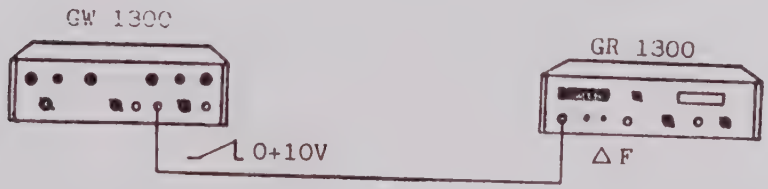
6.1.7.3 External modulation



Switch the functions switch onto "EXT.MOD", the attenuation still on minimum.
Depress the trigger toggle switch onto " ⌐↑ ".
Adjust the BF generator to 0/+3V level and sweep the frequency in the 0 - 500 KHz range.
Check on the oscilloscope's screen that the frequency of the modulating signal is the same as that of the external signal.
Follow the same procedure with a BF signal of 0/-3V level and depressing the trigger toggle switch on " ↓⌐ "

6.1.7.4 Sweeping

△F narrow band sweeping



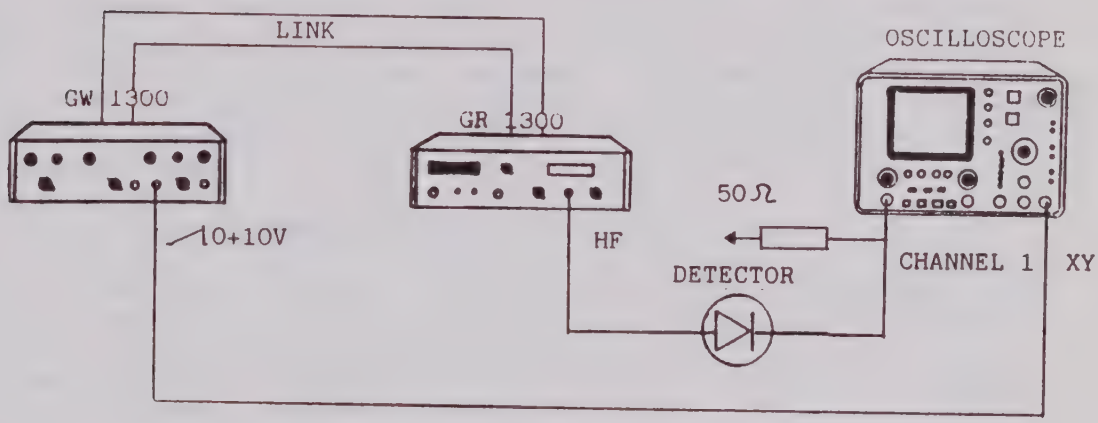
Switch the generator's function switch onto "CW" and the readout selectors onto "FREQUENCY" and "MHz".

Switch the GW 1300 onto "MANUAL" and turn the level potentiometer completely to the left in order to obtain a 10V voltage on the D.S. output.
Check the ΔF excursion on the GR 1300 readout by turning the ΔF adjustment of the potentiometer and check that the excursion is 100 MHz, i.e. 10 MHz/Volt.

NOTE : For generators with a maximum frequency of 8 GHz, the frequency excursion is 50 MHz, i.e. 5 MHz/Volt.

Wide band sweeping

Carry out the following assembly :



ATTENTION

Switch off the instrument before cables are connected.
Depress the GR 1300 frequency toggle switch onto "EXT.AUTO".
On the sweep oscillator select the frequency at the beginning (F1) and at the end (F2) of the band.
Switch the functions switch onto "WF" and check in XY mode on oscilloscope that the sweep takes place between the selected limits.

6.2 CALIBRATION

Calibration procedures reset the GR 1300 with its original characteristics during service or maintenance. An annual service is recommended.

WARNING : Do not insert or take out the boards when the instrument is switched on.
Switch on the instrument at least 30 minutes before calibration.
Switch the instrument onto manual mode.
For a general calibration, make the adjustments in the order of the paragraphs.

6.2.1 Oscillator power supply (on 501506)

First check that the R131 potentiometer is blocked so that the oscillator's power supply (11 of J1) is constant on the total frequency band.
Connect the 20V calibre voltmeter to 11 of J1 and adjust R131 to obtain a nominal power supply of 15V.

6.2.2 Reference + 2,5V (on 501506)

Connect the voltmeter to 20 of J1 and adjust R129 in order to obtain a reference power supply of 2.5V.

6.2.3 Readout (on 511503)

The readout indicates the frequency in GHz. Connect a numerical voltmeter, calibre 2V, to the 100mV/GHz output and adjust the R72 potentiometer in order to obtain the 100mV/GHz correspondence between the voltmeter and the GR 1300 readout, from minimum to maximum frequency. If necessary, share out any error.

6.2.4 Minimum frequency output (on 501506)

The functions switch being on "CW", connect a frequencymeter to the generator's output and turn manual controls of the frequency to minimum.
Adjust the R128 potentiometer in order to obtain the lowest range frequency, minus 0.5 to 1%.

6.2.5 Maximum frequency output (on 501506)

- This operation must be carried out after adjustment of minimum frequency.

- The functions switch stays on "CW". Connect a microwave counter to the generator's output and turn the manual controls of the frequency to maximum.

- Adjust the R127 potentiometer to obtain the highest range frequency plus 0.5 to 1%.

6.2.6 GHz readout (on 501506)

Connect a frequencymeter to the generator's output and adjust R121 for maximum frequency and R124 for minimum frequency. As these adjustments are interdependent, they must be made several times until accuracy of around 0.3% is obtained in the total band of the generator (after stabilization) when passing rapidly from minimum to maximum frequency and inversely.

6.2.7 Readout compensation (on 501506)

In rapid sweeping, adjust R123 to obtain the real center frequency by connecting a frequencymeter to the output. The measurement is triggered by the sweep oscillator (EIP frequencymeter, DANA 451).

6.2.8 △ F sensitivity (on 501506)

Connect a frequencymeter to the output of the generator, then adjust the frequency in the center of the band. Inject a power supply of +10V to the △ F input panel with the sensitivity adjusted to maximum ; adjust R125 to obtain a frequency displacement of around 100 MHz for models which have a maximum frequency not exceeding 8 GHz.

6.2.9 MHz readout (on 501506)

No cable being connected to △F input, adjust R122 to read 0 MHz on the readout.
Connect the RF output of the generator to a frequencymeter and apply power supply of +10V to the △ F input. Adjust R130 to obtain on the readout the same value as the frequency gap recorded on the frequencymeter.
Check the high and low range and adjust R130, if necessary, to share out the error.

6.2.10 Set level dynamic (on 502509)

Connect a powermeter to the output of the generator and switch the "FUNCTIONS" switch onto "CW".
The attenuator controls are on 0 dB, attenuate to a maximum with the set control and adjust R92 so that the level is always lower than 0 dB by at least 5 dB throughout the frequency range. If the RF module has been replaced, modify, if necessary straps 7, 8 and 9.

NOTE : For GR 1318/1328 models, calibration takes place at -10 dBm and therefore R92 should be adjusted to obtain at least -15 dBm.

6.2.11 "dBm" readout amplifier (on 502509)

Adjust the frequency control at the beginning of the band. The two attenuator controls are on minimum ; adjust R91 to read +00.0 in dBm. The step control is on maximum and variable on minimum.
Adjust R91 to read -110.0 dBm.

6.2.12 Attenuation linearization 0 - 11 dB (on 502509)

First adjust the R85 potentiometer to the left-hand block.
Connect a powermeter to the output and adjust the set level switch to obtain 0 dBm at the output when the attenuator switch is on minimum attenuation.
Adjust the level potentiometer to attenuate from 1 dB the level read on the powermeter and adjust R83 to read -1dBm on the generator.

Attenuate the variable level switch to maximum and adjust the attenuator dynamic to -11.5 dBm on the powermeter with the R82 potentiometer.
Attenuate with the variable switch to read -5 dBm on the readout of the generator and adjust R84 to obtain the same reading on the powermeter.
The same procedure for -10 dBm where the adjustment is made with R86.
If the linearization adjustment is not possible, modify the electric current sensitivity by soldering straps 3, 4, 5 and 6 onto the different adjustment transistors (R21, R22, R23 and R25). This operation is often necessary when replacing the variable attenuator.
Check the accuracy of the attenuator in the total frequency band for an output level of 0 dBm and of -10 dBm and adjust, if necessary, to share out the errors.

6.2.13 "0 dBm" calibrator sensitivity (on 502509)

First turn the R90 potentiometer 6 ½ turns to the left.
Apply a 0 dBm (-10 dBm for GR 1318/1328 models) to the calibrator input and adjust R88 to light up the central segment of the galvanometer, use R89 to adjust the end of R88. Make the adjustment at the beginning and at the end of the band and if necessary, share out the error.
Adjust the sensitivity with R90 to keep the central segment alight in a range from ± 0.1 dBm and readjust, if necessary R89.
Check the validity of the adjustment on the total frequency band.

6.2.14 Pulse generator (502511)

Switch the "FUNCTIONS" switch onto "INT.MOD" and apply a trigger signal of around 1 KHz.
Display a repetition of 1000 µs, a delay of 500 µs and a pulse width of 50 µs. Observe on the oscilloscope the end of the RF pulse detected in relation to the beginning of the synchro pulse.
For an internal or external trigger, the signal must be in the same place on the screen. If it is not, adjust the R50 for un external trigger so that its position coincides that of the internal trigger.

6.2.15 Trigger and switch circuit in external modulation (on 502512)

Switch the "FUNCTIONS" switch onto "EXT.MOD" and adjust R54 until the RF light goes off, for both positions of the trigger toggle switch.
Check that the modulation is correct in positive and in negative with a modulation signal of around 0/± 3V or 0/± 0.5V to 0/± 1V if the CR5 and CR6 diodes are out of order.

6.2.16 Pulse width : 50 ns (-0, + 20 ns) to 1 µs (on 502518)

Switch the "FUNCTIONS" switch onto "INT.MOD" and depress the trigger toggle switch onto "INT.TRIG".
On the width thumbwheels, display 0 µs and turn the progressive control of the width onto minimum.
Observe on the oscilloscope the width of the pulse and adjust R51 to obtain a width of 50 ns (-0, +20ns).
Turn the progressive control of the width to maximum and adjust R52 to obtain a width slightly wider than 1 µs (by a few nanoseconds) in order to ensure overlapping with the thumbwheel adjustment.

6.2.17 Relay control (on 501530)
Option 13 for models GR 1306, 1310 and 1318

Turn the "FUNCTIONS" switch onto "CW".
Connect a frequencymeter on the RF output of the generator and adjust the frequency at the central value of the band.
Adjust the potentiometer R14 to obtain commutation in the middle of the band. The DS1 diode facilitates the adjustment by lighting up the commutation point is reached during a sweep from the minimum frequency to the maximum frequency.
Check with the spectrum analyzer that the level loss does not exceed 3 dB for the total band.

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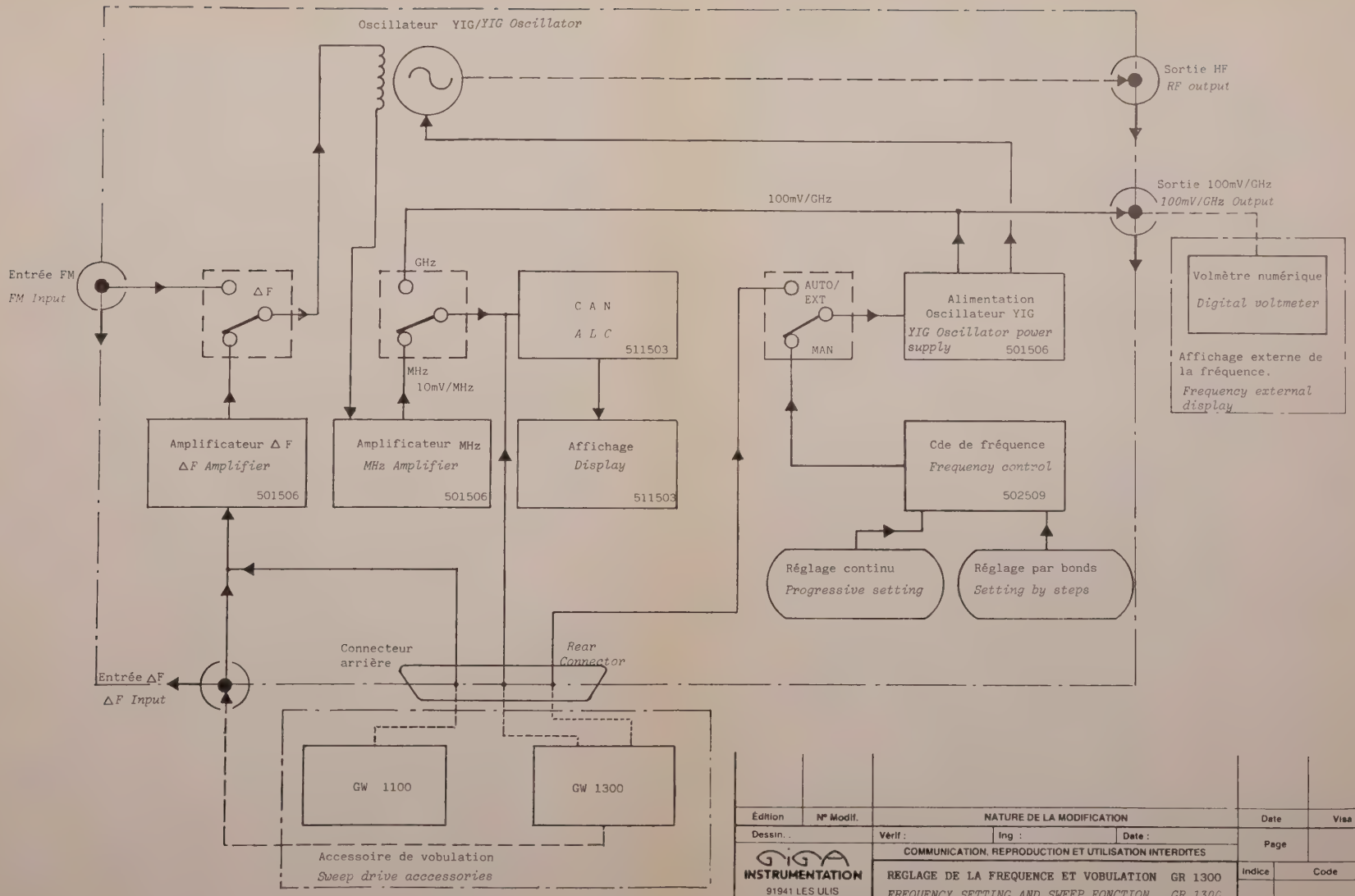

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COMMUNICATION, REPRODUCTION ET UTILISATION INTERDITES

GIGA INSTRUMENTATION
91941 LES ULIS
FRANCE

REGLAGE DE LA FREQUENCE ET VOBULATION GR 1300
FREQUENCY SETTING AND SWEEP FONCTION GR 1300

Indice | Code

7 DESCRIPTION AND OPERATION

7.1 GENERAL DESCRIPTION

7.1.1 Frequency control

7.1.1.1 Manual frequency control (toggle switch on "MANUAL")

The YIG oscillator is linked to a control circuit, the YIG oscillator power supply. This assembly constitutes a power ---> frequency converter. This power circuit (501506) generates a 100mV/GHz signal, proportional to the output frequency, which is converted in a binary word for numerical readout of the frequency when the MHz/GHz toggle switch is on "GHz".

7.1.1.2 Automatic frequency control (sweeping)

The GR 1300 frequency driving by the sweep oscillator is carried out by making certain connections :

- Control of the YIG oscillator power (frequency control toggle switch on "EXT.AUTO").

- Readout control (MHz/GHz toggle switch on "GHz").

The combination of a GR 1300 and a GW 1300 can be completely assimilated as a sweep oscillator.

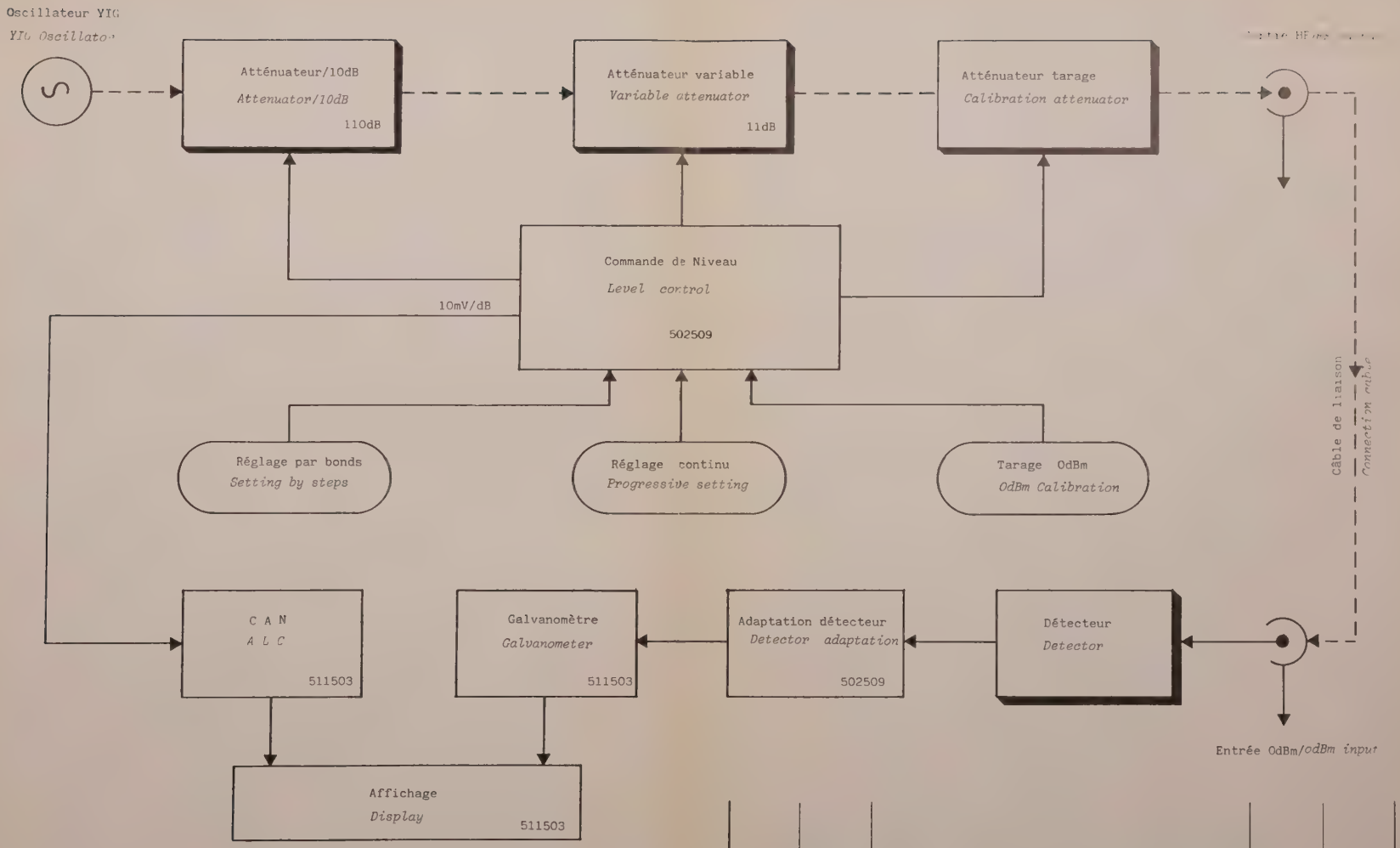
7.1.1.3 Narrow band sweeping (frequency excursion, frequency toggle switch on "MANUAL")

It can be carried out in two ways :

- Current control via the FM input which is directly linked to the auxiliary winding of the YIG oscillator (Δ F toggle switch on the front panel switched down).

- Voltage control by the Δ F input with GW 1300 accessories or the GW 1100. The input power is converted into a current by the Δ F amplifier in order to feed the auxiliary winding of the YIG oscillator (Δ F toggle switch switched up).

- The 10 mV/GHz signal, which is the image of the current flowing in the auxiliary winding of the oscillator, allows readout of the sweeping frequency relative to the start frequency (MHz/GHz toggle switch on "MHz").



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COMMUNICATION, REPRODUCTION ET UTILISATION INTERDITES

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REGLAGE DE NIVEAU ET CALIBRATION OdBm — GR 1300
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7.1.2 Level set and 0 dBm calibration

7.1.2.1 Level set

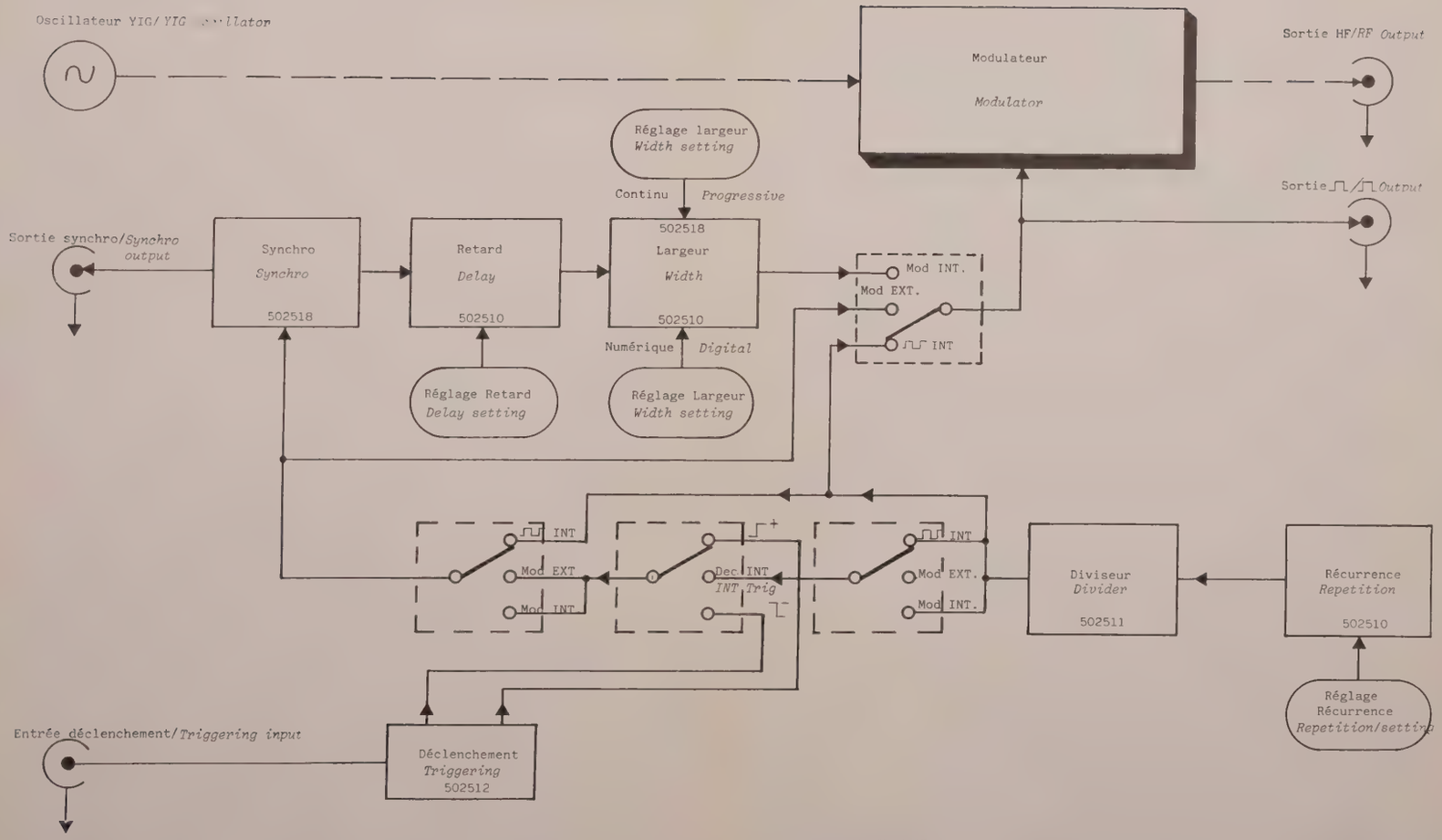
Level control can be carried out in a progressive way (with the 0 to 11 dB variable attenuator and/or by commutation (with the attenuator by steps of 10 dB, 0 to 110 dB).

The 10 mV/dB signal delivered by the level control is converted into a binary word to allow numerical readout of the level.

7.1.2.2 0 dBm calibration

The principle of calibration consists of adjusting the RF level to 0 dBm, taking into account the losses caused by the connecting cable. The RF signal applied to the 0 dBm input via the cable, passes through a detector which delivers a voltage representing the level. This power is amplified and adapted to the galvanometer which is a window comparator. The result of the comparison lights up one of the three horizontal segments of the right-hand readout. The central segment lights up for a 0 dBm level applied to the 0 dBm input.

NOTE : Calibration takes place at -10 dBm for the GR 1318 model.



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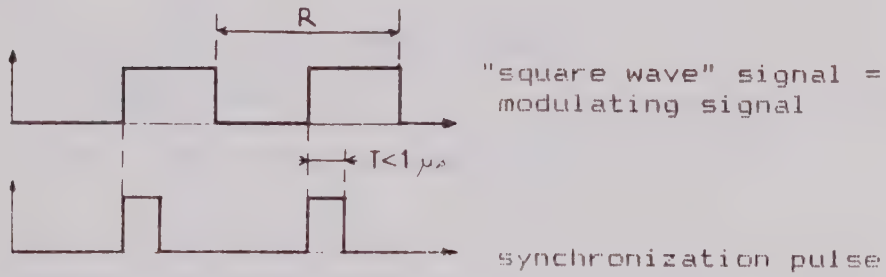
GIGA INSTRUMENTATION 91941 LES ULIS FRANCE		COMMUNICATION, REPRODUCTION ET UTILISATION INTERDITES MODULATIONS GR 1300 *MODULATIONS GR 1300*	Indice	Code

7.1.3 Modulation

7.1.3.1 Internal square wave modulation

Since the form of the modulating signal has a constant duty cycle (50%), adjustments of delay and width are inhibited. Only the period can be adjusted by the repetition thumbwheel switches.
The "square" signal obtained at the divider output directly affects the modulator and triggers the synchronization pulse which is available at the BNC plug on the front panel.



1 µs ≤ R ≤ 99 999 µs, adjustable by the repetition thumbwheels.

NOTE : A high level applied to the input of the modulator allows the passage of the RF signal and inversely a low level blocks the passage of the RF signal.

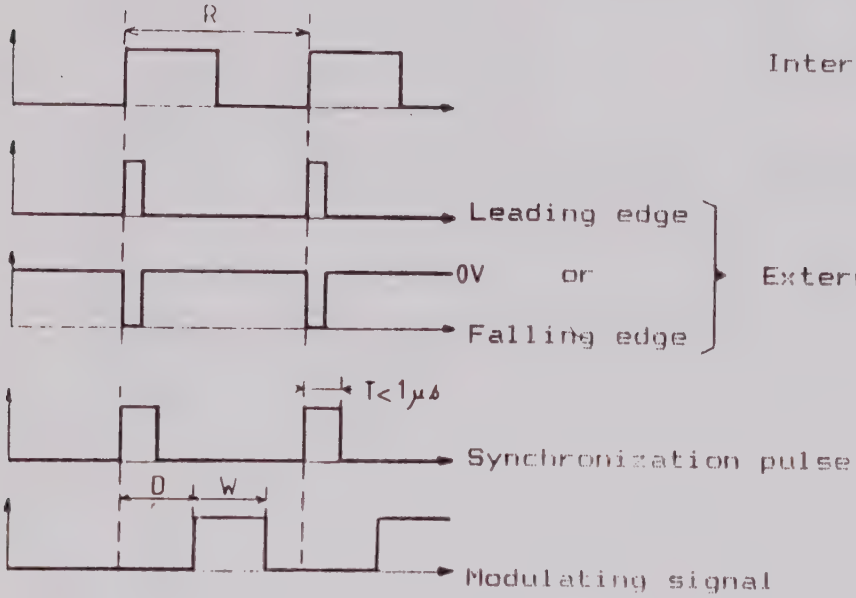
7.1.3.2 Internal pulse modulation

Internal trigger

In the same way as the internal square wave modulation the synchronization pulse is triggered by the square wave signal ; the frequency is adjusted by the repetition thumbwheel switches.
The synchronization pulse is used for starting the delay count. The end of this count allows the carrying out of the width circuit.
These two parameters can also be adjusted locally by thumbwheel switches and also adjusted progressively by the potentiometer for the width.

- External trigger

The external trigger signal can be active either on a leading edge or on a falling edge, its frequency must be between 0 Hz and 500 KHz.
Repetition adjustment on the front panel is inhibited while delay and width are generated in the same way as for the internal trigger.



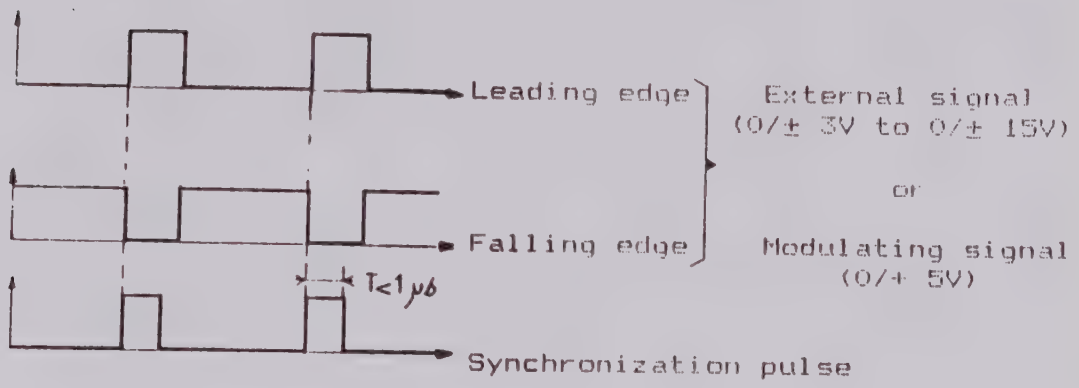
2 µs ≤ R ≤ 99 999 µs, repetition adjustment with thumbwheel switches in internal triggering or external adjustment (signal frequency : 0 to 500 KHz).

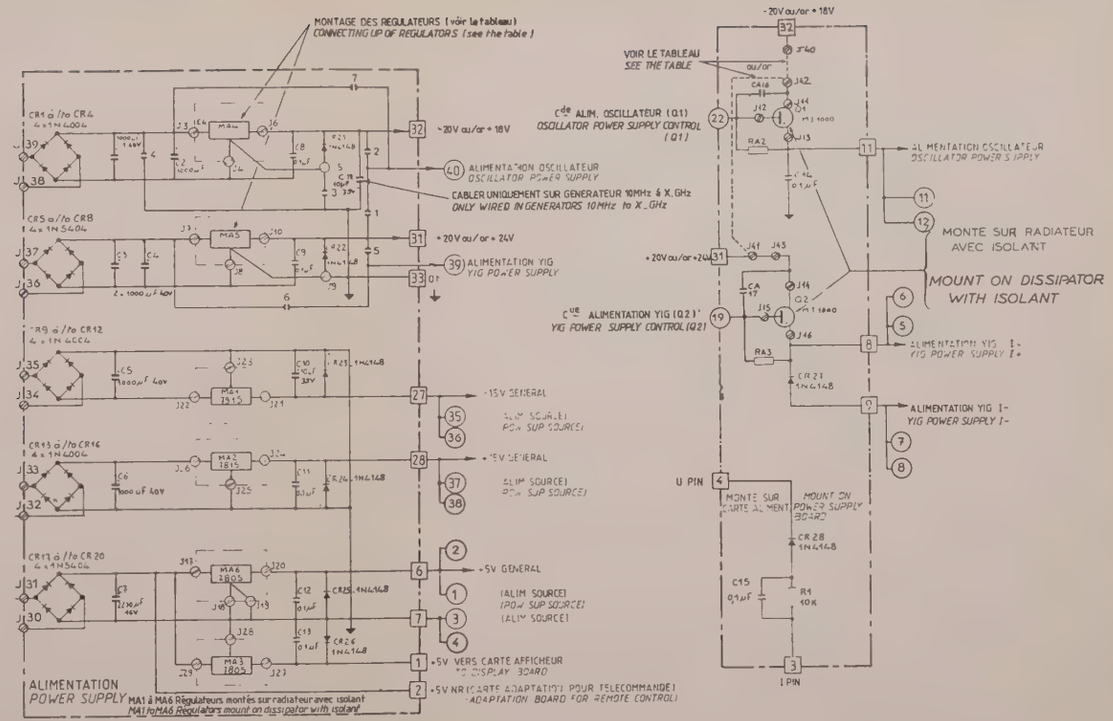
Less than 2 µs ≤ D ≤ 9 999 µs, delay adjustable by thumbwheel switches.

50 ns (-0, + 20 ns) ≤ W ≤ 1 ms, width adjustable by thumwheel switches and potentiometer.

7.1.3.4 External modulation

The signal is applied to the trigger input and its polarity must be selected (the three positions toggle switch must be on "⌐↑" or "↓¬".
The signal generated by the trigger circuit feeds the modulator directly and triggers the synchronization pulse which is available on the BNC plug on the front panel.
All the front panel adjustments of the generator are inactive.

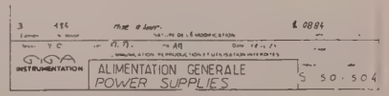




PONTETS STRAPS	court-circuit short circuit	J41 à/to J42	J40 à/to J42
		GENERATEUR 10MHz à/to X_GHz	AUTRES GENERATEURS OTHERS GENERATORS
		MA4 LAS 1820 T03 (-20V)	MA4 MC 7818 T03 (+18V)
		MA5 LAS 1520 T03 (+20V)	MA5 MC 7824 T03 (+24V)
	1	Fermé / Closed	Ouvert / Opened
	2	Ouvert / Opened	Fermé / Closed
	3	Ouvert / Opened	Fermé / Closed
	4	Fermé / Closed	Ouvert / Opened
	5	Fermé / Closed	Fermé / Closed
	6	Ouvert / Opened	Ouvert / Opened
	7	Ouvert / Opened	Ouvert / Opened

VERS INTERCONNECXION GENERALE / TO GENERAL INTERCONNECTION

VERS CARTE ALIMENTATOIN OSCILATEUR YIG / TO POWER SUPPLIES YIG OSCILLATOR BOARD



7.2 MICROWAVE ASSEMBLY

7.2.1 General information

The structure of the microwave assembly being exclusively monoband, the assembly of the microwave components is the same for all versions of the GR 1300. The generation of the microwave signal is ensured by one YIG oscillator covering the whole of the frequency band. The oscillator is followed by an attenuator switched by steps of 10 dB with a dynamic total attenuation of 110 dB. Its output is adapted by an isolator. The PIN diodes variable attenuator follows on and allows continuous level adjustment. Its output is adapted by a second isolator. A fast switching modulator then modulates the YIG source output signal. The action is similar to a switch following the rhythm of the modulating signal. The set attenuator which follows allows adjustment of the level to 0 dBm, taking into account the losses caused by the connecting cable. Its output is adapted by a third isolator.

Option 04
A special modulator replaces the standard 80 dB to ensure a modulation depth of 90 dB.
NOTE : This option is not available on the GR 1318/1328

Option 06
A supplementary isolator placed in the source output avoids the pulling of the oscillator.
NOTE : This option is not available on the GR 1320.

Option 13
According to the generator model, three assemblies allow a rejection of the harmonic level to -40 dBc.

- GR 1320, 1328 :

The rejection is ensured by a YIG filter incorporated into the source, automatically matching the oscillation frequency.

- GR 1301, 1302, 1303 :

Since the range delivered by these models is lower than the octave, rejection is carried out by a single low-pass filter followed by an isolator. These elements are located at the end of the microwave assembly.

- GR 1306, 1310, 1318 :

Since these models cover a band higher than or equal to the octave, two low-pass filters switched by two relays followed by an isolator must be used.
These elements are located at the end of the microwave assembly. The switch control is made by an additional relay control circuit.

7.2.2 Main microwave components

The design of the GR 1300 instruments is based on the use of high performances microwave devices : YIG oscillators for the generation of the signals and PIN diodes which ensure the attenuation of the signals.

In addition to these particular components, the microwave assemblies include more usual devices :

- Low-pass filters which deeply attenuate the harmonic levels of the microwave sources (option 13).

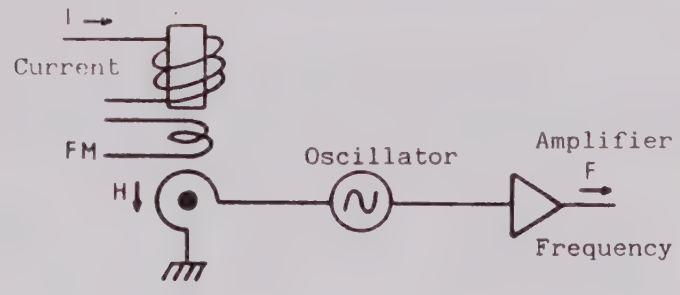
- Isolators which attenuate the reflected waves in order to match the transmission lines, avoid VSWR combinations and reduce the pulling of the oscillators (option 06).

- Mechanical relays which ensure switching of the filters, in-line or off-line, on generators which ranges are smaller than one octave.

7.2.2.1 YIG oscillators

The YIG cristals (Yttrium - Iron - Garnet, Y3Fe5012) are the base of numerous microwave applications.
Some small YIG spheres, which surface is well polished, in order to obtain a high quality coefficient, are used as resonnators in filters and widely tunable oscillators.
By the way, the YIG resonnators own a high selectivity and the spectral purity of the oscillators in which they are used is then excellent.
The frequency of a YIG sphere, in a uniform precession mode is directly proportionnal to the magnetic field in which it stands. This property is well suited to the electronically tunable devices.

A YIG oscillator is then a linear current to frequency converter as shown in figure below. To each value of I, the current passing through the main coil, corresponds a H value of the magnetic field for which the YIG sphere resonnates at the frequency F. This characteristic is used in such systems which necessitate a great frequency agility and a linear control. An auxiliary coil, called the FM coil ensures the frequency modulation of the YIG oscillator.



The oscillator includes a microelectronic microwave circuit (thin film hybrid circuit). This technology relies upon the use of "chips" implanted on a ceramic substrate. Transmission lines and passive circuits are photoetched or machined by ion milling process on the metallic layer.
Temperature-stabilized microwave resistors are produced by photoetching on the resistive substrate sandwich layer. Active components are wired by thermocompression of gold wire ranging from 12 to 25 µs in diameter. The use of very thin substrates (250 µm) enables this technology to be utilized for frequency ranges reaching 40 GHz.

7.2.2.2 Pin diodes attenuator

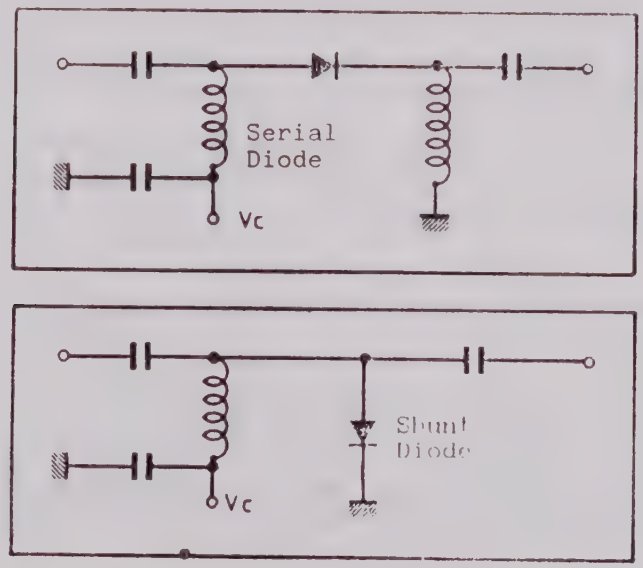
In the switches, the pin diodes were fully biased (forward or reverse). The attenuators use the variable resistance property of the pin diodes : they are designed for an optimal use of the resistance dynamic range.

Two basic configurations may be used :

- The series-diode attenuator, for which the "on" state is defined for a given current Ip. The attenuation is increased when the bias current decreases.

- The shunt-diode attenuator, for which the "on" state is defined for a null current in the diode (even a reverse voltage). The attenuation is obtained when the diode is forward-biased.

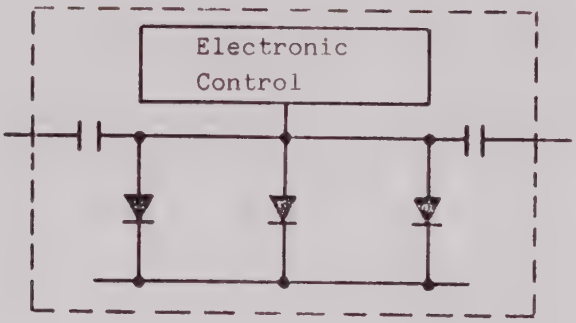
The attenuation dynamic range is directly depending on the resistance dynamic range of the diode. If this is not sufficient, several diodes may be used in parallel, series, or parallel-series patterns.



7.2.2.3 Pin diodes modulators

A pin diodes modulator is a very fast microwave switch. It has two possible states : "on" or "off".

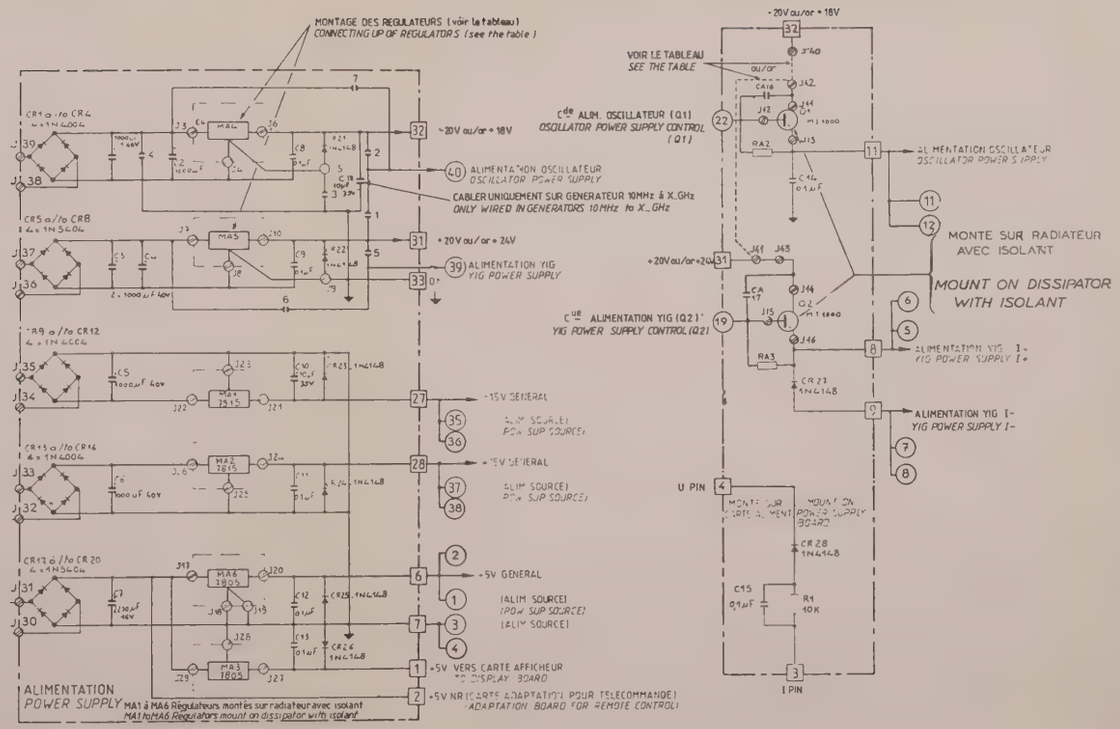
The main characteristics of a modulator are : the insertion loss, the modulation depth (isolation minus loss), the rise-time and the fall-time of the detected signal. The best pattern uses several parallel diodes which increase the modulation depth.



The pin-diodes modulators are generally used as microwave switches. The main characteristic of pulse-diodes, their capability of fast going from "on" state to "off" state, is used with benefit.
The main advantages of pin diodes modulators are :

- a fast response time (<10 ns)
- high modulation depth (>80 dB)
- the capability of working in a broad frequency range (1 to 18 GHz).

The pin diodes modulators are then used in the domains where a very fast amplitude modulation is required.
It can be noticed that a video filter is generally included in the modulator. It is, in fact, a high-pass filter which cut-off frequency is half-way between the maximum value of the modulating signal and the minimum value of the modulated signal.



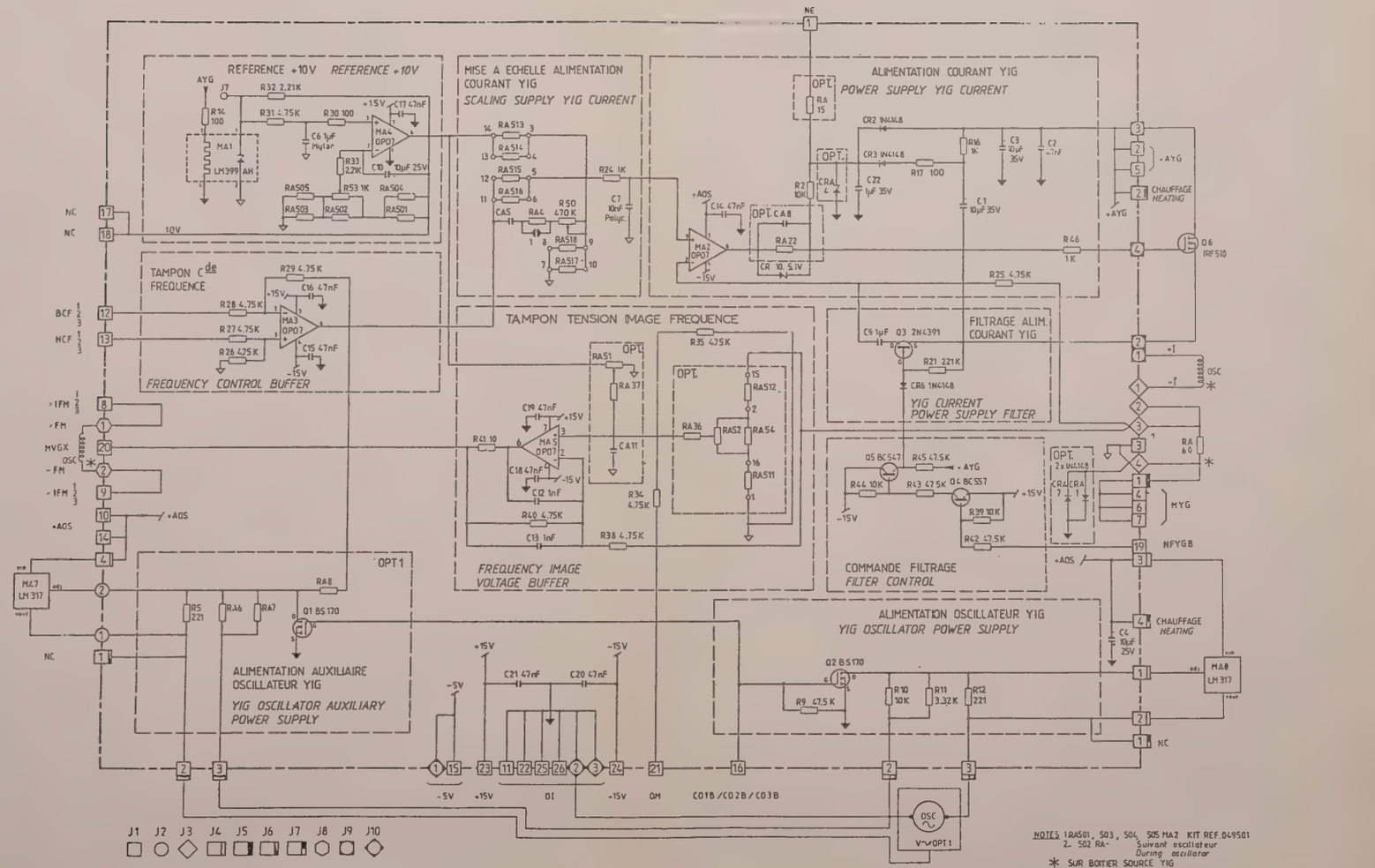
		GENERATEUR / GENERATOR 10MHz à/to X_GHz	AUTRES GENERATEURS OTHERS GENERATORS
	MA4	LAS 1820 T03 (-20V)	MA4 MC 7818 T03 (+18V)
	MA5	LAS 1520 T03 (+20V)	MA5 MC 7824 T03 (+24V)
court circuit / short circuit		J41 à/to J42	J40 à/to J42
PONTETS / STRAPS	1	Ferme / Closed	Ouvert / Opened
	2	Ouvert / Opened	Fermé / Closed
	3	Ouvert / Opened	Fermé / Closed
	4	Ferme / Closed	Ouvert / Opened
	5	Fermé / Closed	Fermé / Closed
	6	Ouvert / Opened	Ouvert / Opened
	7	Ouvert / Opened	Ouvert / Opened

□ J 2
◯ J 1
⊘ PICOT

VERS INTERCONNECXION GENERALE / TO GENERAL INTERCONNECTION

VERS CARTE ALIMENTATOIN OSCILATEUR YIG / TO POWER SUPPLIES YIG OSCILLATOR BOARD

GIGA INSTRUMENTATION
ALIMENTATION GENERALE
POWER SUPPLIES
S 50 504



NOTES 1 RA501, 503, 504, 505 MA2 KIT REF. 04.9501
2 - 502 RA- Suivant oscillateur
During oscillator

* SUR BOITIER SOURCE YIG
ON YIG SOURCE BOX

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7.3 GENERAL POWER

7.3.1 Transformer (062000)

The GR 1300 generators use a standard toroidal transformer for the whole range.
This type of transformer is of reduced size and weight. It requires low excitation currents which produce, when unloaded, a low consumption. This in turn results in high efficiency and low heating. Its leak diffusion is also very low. Secondary winding of the transformer groups together separate windings which supply the different voltages required for the power supply.

7.3.2 General power board (501504)

This circuit contains all the power supplies of the generator, with in addition, an interconnection strip where most of the connections are made.
Besides this, the CR28, R1 and C15 components are used as an interface with the set PIN diode when the generator is connected to the GW 1300 sweep oscillator in order to view the amplitude markers.

7.3.2.1 Double power supply + 5V

The S1 secondary winding of the transformer (J30, J31 : 10V rms) supplies power to the rectifying bridge (CR17 to CR20). The output power is filtered by C7 capacitor which supplies two integrated regulators (MA3 and MA6) thermally protected. MA6 is mounted on a heat sink in order to supply + 5V to the whole instrument and MA3 is wired directly onto the printed circuit in order to supply the + 5V to the readout card.
The C12 and C13 capacitors placed at the output of the regulators, improve regulation in the transition period.
CR25 and CR26 diodes ensure protection so that the outputs never become negative, particularly when plugging in.

7.3.2.2 Power supply + 15V

The S2 secondary winding of the transformer (J32, J33 : 18.5V rms) supplies power to a diode bridge, then a capacitor and a regulator are assembled in the same way as the previous one (S2, CR13 to CR16, C6, MA2, C11, CR24).

7.3.2.3 Power supply - 15V

The S3 secondary winding of the transformer (J34, J35 : 18.5V rms) supplies power to a diode bridge, then a capacitor and a regulator are assembled in the same way as the previous one (S3, CR9 to CR12, C5, MA1, C10, CR23).

7.3.2.4 Power supply + 24V

The S4 secondary winding of the transformer (J36, J37 : 26V rms) supplies power to a diode bridge, then a capacitor and a regulator are assembled in the same way as the previous one (S4, CR5 to CR8, C3, C4, MA5, C9, CR22).

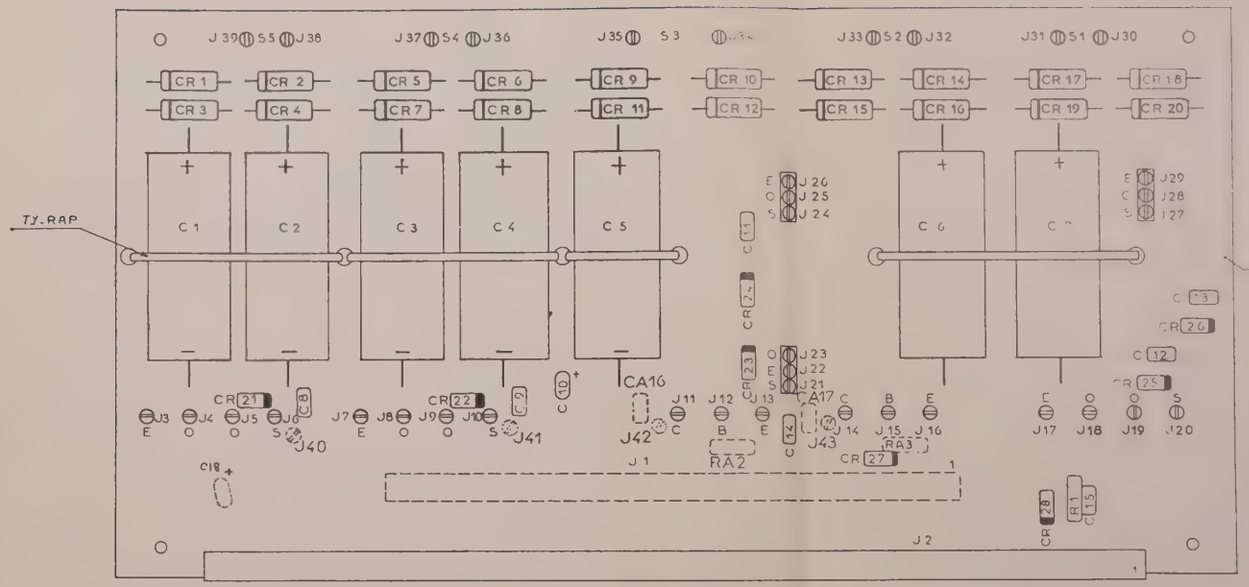
The + 24 voltage of this power supply can be used for warming up some oscillators.

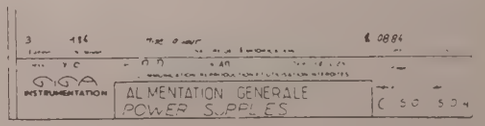
7.3.2.5 Power supply + 18V

The S5 secondary winding of the transformer (J38, J39 : 22V rms) supplies power to a diode bridge, then a capacitor and a regulator are assembled in the same way as the previous one (S5, CR1 to CR4, C1, C2, MA4, C8, CR21).
This power supply can be used for pre-regulation of the oscillator power supply.

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CIRCUIT IMPRIME/PRINTED CIRCUIT	080301
	RESISTANCES/RESISTORS	
R1	10K 1% 1/4W 50ppm	312100
	CONDENSATEURS/CAPACITORS	
C1	1000µF 40V TYPE CO 33	024840
C2	1000µF 40V TYPE CO 33	024840
C3	1000µF 40V TYPE CO 33	024840
C4	1000µF 40V TYPE CO 33	024840
C5	1000µF 40V TYPE CO 33	024840
C6	1000µF 40V TYPE CO 33	024840
C7	2200µF 16V TYPE CO 33	024222
C8	100 nF CK 05 BX 104 100V	025410
C9	100 nF CK 05 BX 104 100V	025410
C10	10 µF TANTALE goutte 35V/TANTALUM drop 35V	023610
C11	100 nF CK 05 BX 104 100V	025410
C12	100 nF CK 05 BX 104 100V	025410
C13	100 nF CK 05 BX 104 100V	025410
C14	100 nF CK 05 BX 104 100V	025410
C15	100 nF CK 05 BX 104 100V	025410
	DIODES	
CR1	1N4004	031002
CR2	1N4004	031002
CR3	1N4004	031002
CR4	1N4004	031002
CR5	1N5403 ou/or 1N 5404	031016
CR6	1N5403 ou/or 1N 5404	031016
CR7	1N5403 ou/or 1N 5404	031016
CR8	1N5403 ou/or 1N 5404	031016
CR9	1N4004	031002
CR10	1N4004	031002
CR11	1N4004	031002
CR12	1N4004	031002
CR13	1N4004	031002
CR14	1N4004	031002
CR15	1N4004	031002
CR16	1N4004	031002
CR17	1N5403 ou/or 1N 5404	031016
CR18	1N5403 ou/or 1N 5404	031016
CR19	1N5403 ou/or 1N 5404	031016
CR20	1N5403 ou/or 1N 5404	031016
CR21	1N4148	031003
CR22	1N4148	031003
CR23	1N4148	031003
CR24	1N4148	031003
CR25	1N4148	031003
CR26	1N4148	031003
CR27	1N4148	031003
CR28	1N4148	031003

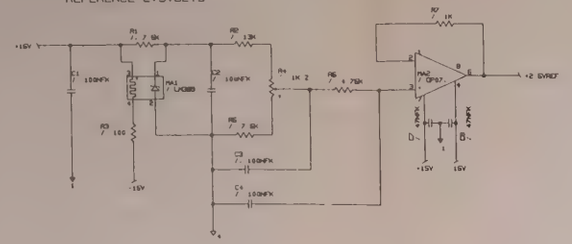
REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	TRANSISTORS	
Q1	MJ1000 TO3	032002
Q2	MJ1000 TO3	032002
	REGULATEURS/REGULATORS	
MA1	- 15V 7915 TO 220	033010
MA2	+ 15V 7815 TO 220	033009
MA3	+ 5V 7805 TO 220	033808
MA4	- 20 LAS 1820 TO 3 ou/or	033007
	+ 18V MC 7818 TO 3	033004
MA5	+ 20V LAS 1520 TO3 ou/or	033006
	+ 24V MC 7824 TO 3	033005
MA6	+ 5V 7805 TO 3	033008
	CONNECTEURS/CONNECTORS	
J1	SCD 40	071107
J2	2527	071923
	DIVERS/MISCELLANEOUS	
T1	TRANSFORMATEUR TTA/TRANSFORMER TTA 4745	062000
J3 à/to J20	DF 929 POINTS DE TEST/TEST POINTS	090502
J21 à/to J29	COMATEL POINTS DE TEST/TEST POINTS	090514
J30 à/to J43	DF 929 POINTS DE TEST/TEST POINTS	090502
4	COLLIERS/4COLLARS	092102
4	SUPPORTS POUR TO3/4SOCKETS FOR TO3	090710
2	ISOLANTS POUR TO3/2 INSULATORS FOR TO3	092206
4	ISOLANTS POUR TO220/4 INSULATORS FOR TO 220	092207
4	CANONS ISOLANTS/4 INSULATORS BANELS	092201
5	ENTRETOISES 3 X 18/5 BRACES 3 X 18	090607
5	ENTRETOISES 3 X 12/5 BRACES 3 X 12	090605
5	ECROUS DIAM 4/5 BOLTS DIAM 4	139003
2	ECROUS HU DIAM 3/2 BOLTS DIAM 3	139002
5	RONDELLES 4 X 8 X 1/5 WASHELS 4 X 8 X 1	137503
4	VIS TCF 3 X 5/4 TCF SCREWS 3 X 5	130505
2	VIS TCL 3 X 12/2 TCL SCREWS 3 X 12	132002

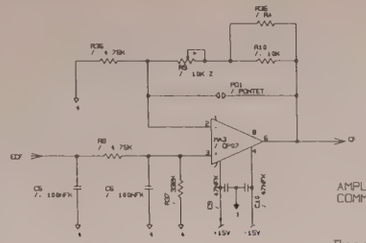

TY-RAP
J39 S5 J38
J37 S4 J36
J35 S3
J33 S2 J32
J31 S1 J30
CR 1
CR 2
CR 3
CR 4
CR 5
CR 6
CR 7
CR 8
CR 9
CR 10
CR 11
CR 12
CR 13
CR 14
CR 15
CR 16
CR 17
CR 18
CR 19
CR 20
C 1
C 2
C 3
C 4
C 5
C 6
J 26
J 25
J 24
J 29
J 28
J 27
J 23
J 22
J 21
CA16
CA17
J42
J43
J40
J41
J1
J2
RA2
RA3
CR 21
CR 22
CR 27
CR 28
J17
J18
J19
J20


ALIMENTATION GENERALE
POWER SUPPLIES

2.5volts reference.

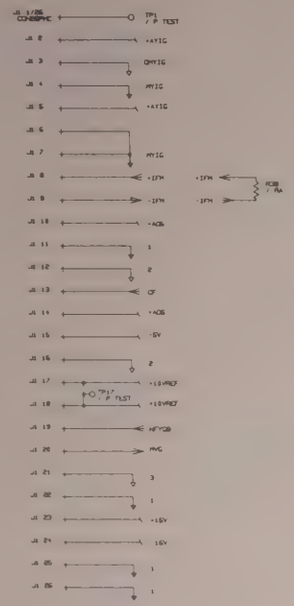
REFERENCE 2.5VOLTS

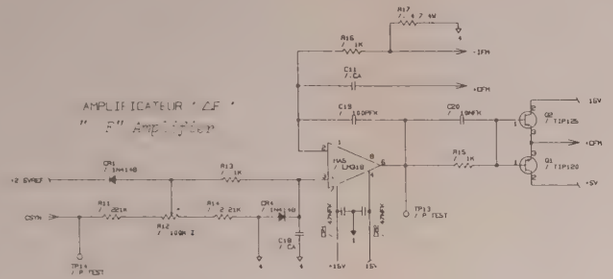




AMPLIFICATEUR
COMMANDE DE FREQUENCE

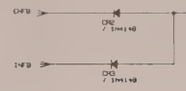
Frequency control Amplifier





AMPLIFICATEUR " CF "

" F" Amplifier

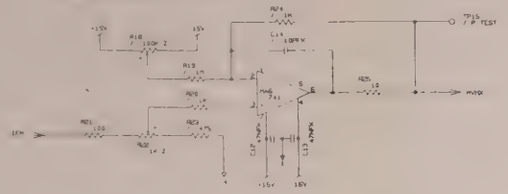


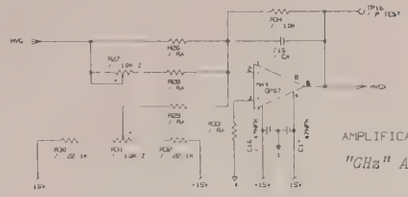
COMMANDE FILTRE

Filter control

"MHz" Amplifier

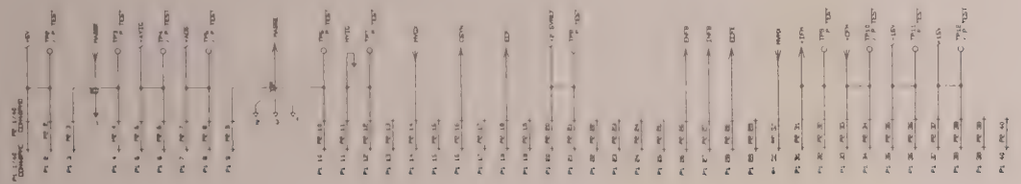
AMPLIFICATEUR " MHZ "





AMPLIFICATEUR " GHZ "

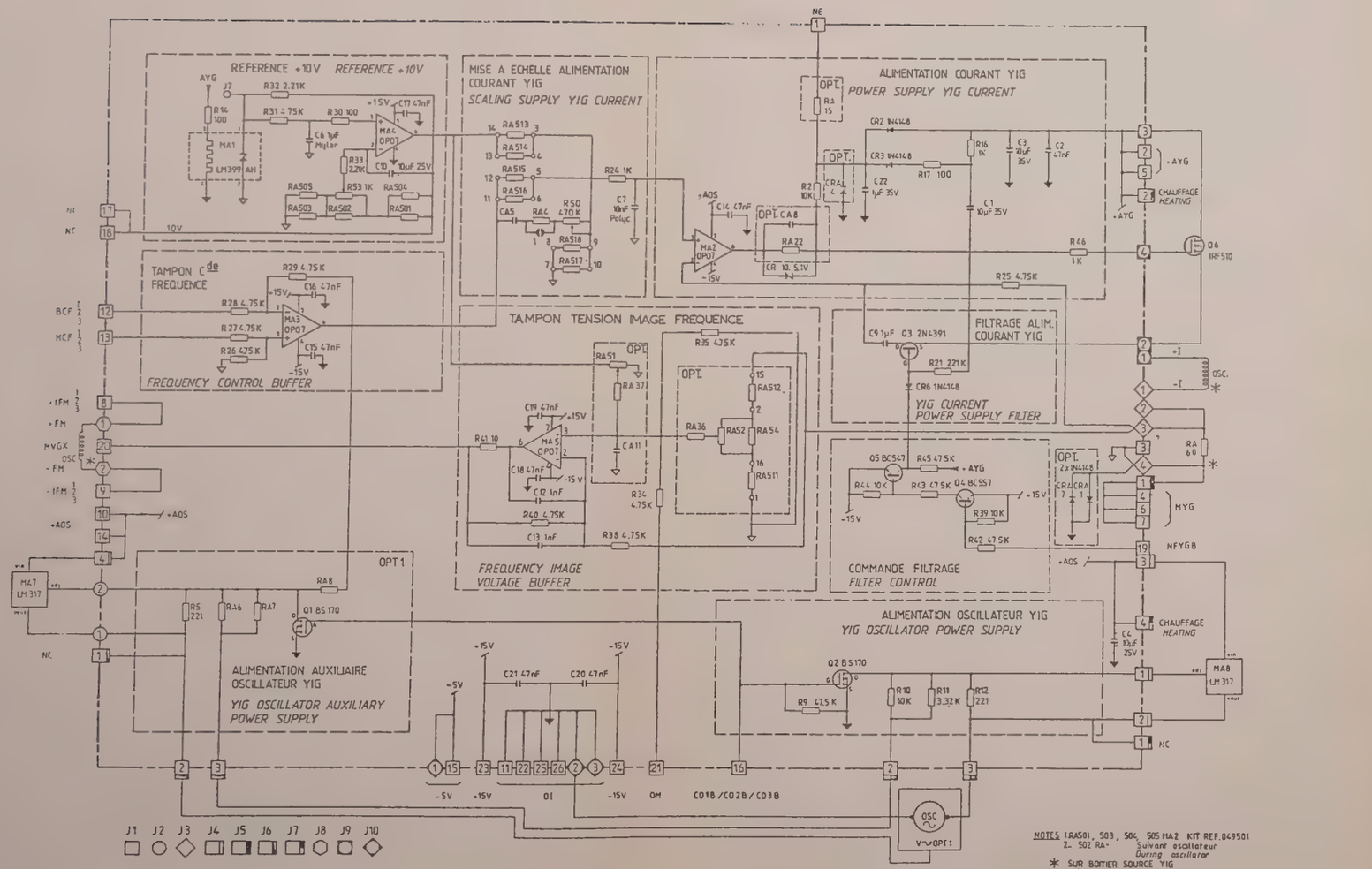
"GHz" Amplifier



YIG POWER SUPPLY
INTERFACE BOARD

Edition	N° Modif	NATURE DE LA MODIFICATION	Date	Visa
Dessin Y. L.		Vérif M. M. Img	Date 10 6 87	Page
		COMMUNICATION REPRODUCTION ET UTILISATION INTERDITES		
INSTRUMENTATION		CARTE INTERFACE ALIMENTATION YIG		Type SU 3.5 - 6

DRIVER 10/06/87 ED:B



NOTES 1 RA501, 503, 504, 505 MA2 KIT REF. 049501
2- 502 RA* Suivant oscillateur / During oscillator

* SUR BOITIER SOURCE YIG / ON YIG SOURCE BOX

2		Résistance R66 ajoutée	12/84	JPC
1		Jack de face supprimé	07/84	
Edition	N° Issue	NATURE DE LA MODIFICATION	Date	Visa
Dessiné	Vérifié	Visa	Date	Pages
SYSTRA INSTRUMENTATION 91441 LES ULIS Cedex	COMMUNICATION EN PRODUCTION ET UTILISATION INTERDITES			
	ALIMENTATION BOITIER YIG / YIG BOX POWER SUPPLY		Format :	Code : SIS20565

7.4 YIG OSCILLATOR POWER SUPPLY

When the YIG oscillator is set in a self contained box which aims to reduce or even to cancel the microwave leakages, the frequency range is made by two boards which functions are mentionned in the following paragraphs.

7.4.1 Interface board for YIG oscillator power supply (503506)

This board, straight plugged on the general power supply board, controls the frequency of the signal given by the microwave source by supplying power voltage to the oscillator and the current to the electromagnet in order to generate the H magnetic field.

Other circuits are used for :

- modulation or synchronization of the microwave signal by injecting a current into the source secondary winding.
- supplying measurement voltages to the numerical readout of the generator.

The different voltages and controls useful for the generation of the microwave signal forward by a nappe link coming from J1 connector, those required for the readout are relayed by the general power supply board.

7.4.1.1 Output frequency control

The control of the output frequency is carried out with a power supply reference of 2.5V, very stable and quiet, delivered by the 2.5V REFERENCE circuit.

The 2.5V voltage amplified by MA3 allows generation of the YIG oscillator power supply within the YIG SUPPLY board (520568).

The frequency range covered by the oscillator is determined by the **frequency control** circuit located on the board and **filter control** and **YIG power supply** circuits located on YIG SUPPLY BOARD (520568).

- 2.5V reference

A MA1 integrated circuit with a thermostatic diode delivers a fixed voltage of around 6.9V which is reduced and adjusted to +2.5V by the R2, R4 and R5 network. After filtering by C3, R6 and C4, the 2.5 voltage feeds the MA2 amplifier, assembled as a follower, in order to be applied on a low source impedance to the circuits : source power supply, frequency control, level control and readout control boards of the generator.

- Frequency control

The variable continuous signal 0-2.5V which is given :

. either by the potentiometer of the local adjustment fed by the +2.5V reference voltage.
. or by the GW 1300 base for an external sweeping mode,

is amplified by MA3 to control the frequency range of the oscillator.

The output voltage 0 - 10V is then applied to the YIG power supply circuit.

- Filter control

The two diodes CR2 and CR3 are used as a "AND" function between the two signals transmitted by the frequency range switch and the GW 1300 base unit via the multi-pin connector (rear panel of the generator) and the manual EXT/AUTO switch before feeding the filter stage of the YIG SUPPLY BOARD (520568) located in the YIG box required to cancel the leakages.

7.4.1.2 Sweeping or synchronization of the signal

The command signal with an amplitude lower than +10V applied to the F input of the generator is either a variable signal to sweep the source frequency on a narrow band or a synchronization signal supplied by a synchronizer.

The input signal feeds, across the R11, R12 and, R14 network, the MA5 amplifier which forms, with the Q1-Q2 stage, the current adjustment circuit of the source auxiliary winding.

The control current is controlled by the R17 resistor and the MA5 amplifier is assembled as a comparator. The transmission of the adjustment circuit of the current to the auxiliary winding is carried out directly between the board and the module.

7.4.1.3 Display amplifier

The numerical readout of the generator displays indifferently the output frequency, expressed in GHz, or the sweeping frequency expressed in MHz. The value displayed is a result of the analogic/numerical conversion of the measurement voltage selected by the GHz/MHz switch : 100mV/GHz or 10mV/MHz.

The 100mV/GHz allows output frequency readout which corresponds to the current injected into the main source winding. The measurement voltage is taken from the voltage applied to the input of the MA4 amplifier by the R27, RA26 and RA28 network which value allows the adjustment of the gain in order to get an output voltage of 100mV/GHz whatever the YIG sensitivity (generally between 6 and 20MHz/mA). The R30, R31, R22 and RA29 network realizes an offset in order to compensate the retentivity of the source magnetic circuit.

The 10mV/MHz signal allows display of the frequency deviation corresponding to the current injected into the source auxiliary winding. The measurement voltage is taken from the voltage drop across R17 and applied to the MA6 amplifier by the R21, R22 and R23 network. The R18 potentiometer corrects the offset of the MA6 input circuit so that a zero value is displayed in the absence of a signal on the F input.

7.4.2 YIG supply board (520568)

The board is located in a self contained box which includes the necessary circuits to normalize the control voltage in a 0 - 10V range corresponding to the frequency range of the oscillator.

MA1 and MA4 form a stable reference which is used to create the current for the low frequency. The differential amplifier MA3 avoids the ground problems of the frequency control.

R513 to R518 sum the offset and the frequency control voltage (they depend on the source). R50 and CA5 compensate for the sweep speed.

This current generator consists of RA60, MA2 and Q6. The control voltage is sent to the non-inverting input of MA2. MA2 compares the voltage across RA60, image of the current, with the control voltage and drives Q6.

C1, R16, R17, CR2 and CR3 are used to increase the pull-up voltage, mainly in the sweeping mode where the positive voltage becomes great on the source of Q6.

C9 and C3 enable the YIG filter by doing an alternative voltage regulation of the source of Q6. Q5 and Q4 interface the NFYGB control.

The differential amplifier MA5 delivers a negative voltage, image of the current and then of the output frequency.

MA8 and Q2 ensure the -15V regulation for the oscillator. The "CO1B, CO2B and CO3B" input is put to the ground so that the oscillator is continuously supplied, the controls previously mentionned being unavailable on the GR 1300 series generators.

SERIE/SERIES GR 1300 — CARTE INTERFACE ALIMENTATION OSCILLATEUR YIG (503506) / INTERFACE BOARD FOR YIG OSCILLATOR POWER SUPPLY

REF	DESCRIPTION	CODE GIGA GIGA PART NR
	CIRCUIT IMPRIME/PRINTED CIRCUIT	081502
	RESISTANCES/RESISTORS	
R1	7,50 KΩ 1% 1/4W 50ppm	311750
R2	13 KΩ 1% 1/4W 50ppm	312130
R3	100 Ω 1% 1/4W 50ppm	310100
R5	7,50 KΩ 1% 1/4W 50ppm	311750
R6	4,75 KΩ 1% 1/4W 50ppm	311475
R7	1 KΩ 1% 1/4W 50ppm	311100
R8	4,75 KΩ 1% 1/4W 50ppm	311475
R10	10 KΩ 1% 1/4W 50ppm	312100
R11	221 KΩ 1% 1/4W 50ppm	313221
R13	1 KΩ 1% 1/4W 50ppm	311100
R14	2,21 KΩ 1% 1/4W 50ppm	311221
R15	1 KΩ 1% 1/4W 50ppm	311100
R16	1 KΩ 1% 1/4W 50ppm	311100
R17	4,7 Ω 4W RB 59	325904
R19	1 MΩ 1% 1/4W 50ppm	314100
R20	1 KΩ 1% 1/4W 50ppm	311100
R21	100 Ω 1% 1/4W 50ppm	310100
R23	475 Ω 1% 1/4W 50ppm	310475
R24	1 KΩ 1% 1/4W 50ppm	311100
R25	10 Ω 1% 1/4W 50ppm	310010
R30	22,1 KΩ 1% 1/4W 50ppm	312221
R32	22,1 KΩ 1% 1/4W 50ppm	312221
R34	10 KΩ 1% 1/4W 50ppm	312100
R36	4,75 KΩ 1% 1/4W 50ppm	311475
R37	332 KΩ 1% 1/4W 50ppm	313332
	DIODES	
CR1	1N4148	031003
CR2	1N4148	031003
CR3	1N4148	031003
CR4	1N4148	031003
	TRANSISTORS	
Q1	TIP 120	032003
Q2	TIP 125	032004

SERIE/SERIES GR 1300

CARTE INTERFACE ALIMENTATION OSCILLATEUR YIG (503506)
INTERFACE BOARD FOR YIG OSCILLATOR POWER SUPPLY

REF		DESCRIPTION	CODE GIGA GIGA PART NR
		CONDENSATEURS/CAPACITORS	
C1	100nF	CK05 BX 104	025410
C2	100nF	CK05 BX 104	025410
C3	100nF	CK05 BX 104	025410
C4	100nF	CK05 BX 104	025410
C5	100nF	CK05 BX 104	025410
C6	100nF	CK05 BX 104	025410
C7	47nF	CK05 BX 473	025347
C8	47nF	CK05 BX 473	025347
C9	47nF	CK05 BX 473	025347
C10	47nF	CK05 BX 473	025347
C12	47nF	CK05 BX 473	025347
C13	47nF	CK05 BX 473	025347
C14	10pF	CK05 BX 100	025010
C16	47nF	CK05 BX 473	025347
C17	47nF	CK05 BX 473	025347
C19	100pF	CK05 BX 101	025110
C20	10nF	CK05 BX 103	025310
C21	47nF	CK05 BX 473	025347
C22	47nF	CK05 BX 473	025347
		POTENTIOMETRES/POTENTIOMETERS	
R4	1 KΩ	64 W 102	112210
R9	10 KΩ	64 W 103	112310
R12	100 KΩ	64 W 104	112410
R18	100 KΩ	64 W 104	112410
R22	1 KΩ	64 W 102	112210
R27	10 KΩ	64 W 103	112310
R31	10 KΩ	64 W 103	112310
		CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MA1	LM 399		044004
MA2	OP 07		044007
MA3	OP 07		044007
MA4	OP 07		044007
MA5	LM 318		044002
MA6	uA 741		044008

SERIE/SERIES CARTE INTERFACE ALIMENTATION OSCILLATEUR YIG (503506)
GR 1300 INTERFACE BOARD FOR YIG OSCILLATOR POWER SUPPLY

REF		DESCRIPTION	CODE GIGA GIGA PART NR
		CONNECTEURS/CONNECTORS	
P2	254 CIH 40	40 PTS	071216
P1	254 CIP 40	40 PTS	071322
J1	609-2607	MALE 90°	074912
		ELEMENTS AJUSTABLES/ADJUSTABLE COMPONENTS	
RA26			
RA28			
RA29			
RA33			
RA35			
RA38			
CA11			
CA15			
CA18			
		DIVERS/MISCELLANEOUS	
XMA2	J231808	**SUPPORT CI 8 BROCHES**/8 PIN IC SOCKETS	090701
XMA3	J231808	**SUPPORT CI 8 BROCHES**/8 PIN IC SOCKETS	090701
XMA4	J231808	**SUPPORT CI 8 BROCHES**/8 PIN IC SOCKETS	090701
XMA6	J231808	**SUPPORT CI 8 BROCHES**/8 PIN IC SOCKETS	090701
XQ1	SE 3C	**ISOLANT TO 220**/TO 220 INSULATOR	092207
XQ2	SE 3C	**ISOLANT TO 220**/TO 220 INSULATOR	092207
17		**POINTS DE TEST 311-1331000530**/TEST POINTS	090526
2		**VIS TCL 3X8 POUR Q1.Q2**/TCL 3X8 SCREWS FOR Q1.Q2	132001
2		**RONDELLES AZ Ø3**/AZ Ø3 WASHERS	137001
2		**ECROUS HU Ø3**/HU Ø3 BOLTS	139008

SERIE/SERIES
GP 2000

CARTE ALIMENTATION BOITIER YIG (520568-2)
YIG BOX POWER SUPPLY BOARD

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CIRCUIT IMPRIME/PRINTED CIRCUIT	085220
R2	10K 1% 1/4W 50ppm	312100
R5	221 1% 1/4W 50ppm	310221
R9	47,5K 1% 1/4W 50ppm	312475
R10	10K 1% 1/4W 50ppm	312100
R11	3,32K 1% 1/4W 50ppm	311332
R12	221 1% 1/4W 50ppm	310221
R14	100 1% 1/4W 50ppm	310100
R16	1K 1% 1/4W 50ppm	311100
R17	100 1% 1/4W 50ppm	310100
R21	221K 1% 1/4W 50ppm	313221
R24	1K 1% 1/4W 50ppm	311100
R25	4,75K 1% 1/4W 50ppm	311475
R26	4,75K 1% 1/4W 50ppm	311475
R27	4,75K 1% 1/4W 50ppm	311475
R28	4,75K 1% 1/4W 50ppm	311475
R29	4,75K 1% 1/4W 50ppm	311475
R30	100 1% 1/4W 50ppm	310100
R31	4,75K 1% 1/4W 50ppm	311475
R32	2,21K 1% 1/4W 50ppm	311221
R33	2,21K 1% 1/4W 50ppm	311221
R34	4,75K 1% 1/4W 50ppm	311475
R35	4,75K 1% 1/4W 50ppm	311475
R38	4,75K 1% 1/4W 50ppm	311475
R39	10K 1% 1/4W 50ppm	312100
R40	4,75K 1% 1/4W 50ppm	311475
R41	10 1% 1/4W 50ppm	310010
R42	47,5K 1% 1/4W 50ppm	312475
R43	47,5K 1% 1/4W 50ppm	312475
R44	10K 1% 1/4W 50ppm	312100
R45	47,5K 1% 1/4W 50ppm	312475
R46	1K 1% 1/4W 50ppm	311100

SERIE/SERIES
GP 2000

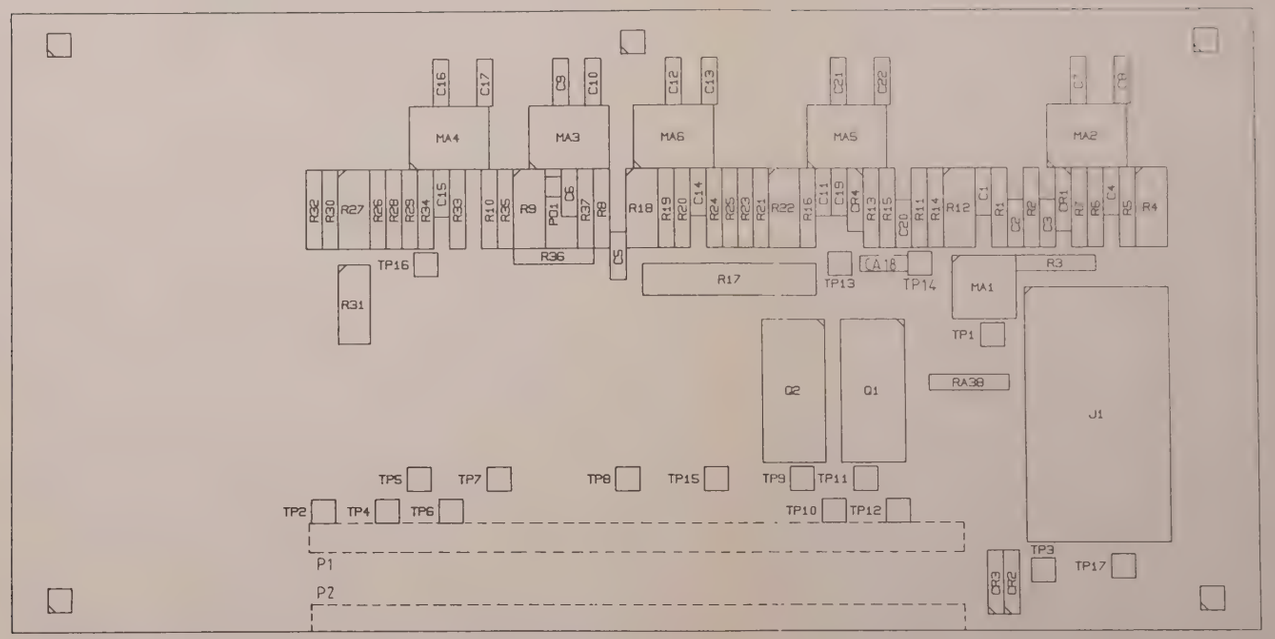
CARTE ALIMENTATION BOITIER YIG (520568-2)
YIG BOX POWER SUPPLY BOARD

REF.		DESCRIPTION	CODE GIGA GIGA PART NR
		POTENTIOMETRES/POTENTIOMETERS	
R50	470K	T7 YB	113447
R53	1K	64 W 102	112210
		CONDENSATEURS/CAPACITORS	
C1	10µF	TANTALE GOUTTE 35V/TANTALUM-DROP 35V	023610
C2	47nF	CK 05 BX 473	025347
C3	10µF	TANTALE GOUTTE 35V/TANTALUM-DROP 35V	023610
C4	10µF	TANTALE GOUTTE 35V/TANTALUM-DROP 35V	023610
C6	1µF	SP 415 40V	022510
C7	10nF	160V CKM 501 ROPEL	022310
C9	1µF	SP 415 40V	022510
C10	10µF	TANTALE GOUTTE 35V/TANTALUM-DROP 35V	023610
C12	1nF	CK 05 BX 102	025210
C13	1nF	CK 05 BX 102	025210
C14	47nF	CK 05 BX 473	025347
C15	47nF	CK 05 BX 473	025347
C16	47nF	CK 05 BX 473	025347
C17	47nF	CK 05 BX 473	025347
C18	47nF	CK 05 BX 473	025347
C19	47nF	CK 05 BX 473	025347
C20	47nF	CK 05 BX 473	025347
C21	47nF	CK 05 BX 473	025347
C22	1µF	TANTALE GOUTTE 35V/TANTALUM-DROP 35V	023510
		DIODES	
CR2	1N4148		031003
CR2	1N4148		031003
CR2	1N4148		031003
CR10		5,1V BZX ZENER 55C	031006
		TRANSISTORS	
Q2		BS 170 VMOS TYPE N 30V	032011
Q3		2 N 4391	032008
Q4		BC 557A PNP 50V 250mW	032018
Q5		BC 547A PNP 50V 250mW	032017
Q6		IRF 510 VMOS TYPE N 100V 3A	032019

SERIE/SERIES
GP 2000

CARTE ALIMENTATION BOITIER YIG (520568-2)
YIG BOX POWER SUPPLY BOARD

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MA1	**LM 399AH 6,9V KIT DE RESISTANCE AJUSTABLE/** ADJUSTABLE RESISTOR LM 399 AH 6.9V	049501
MA2	**OP07 CP CIRCUIT INTEGRE AMPLI OP/** AMPLI OP INTEGRATED CIRCUIT OP07 CP	044007
MA3	**OP07 CP CIRCUIT INTEGRE AMPLI OP/** AMPLI OP INTEGRATED CIRCUIT OP07 CP	044007
MA4	**OP07 CP CIRCUIT INTEGRE AMPLI OP/** AMPLI OP INTEGRATED CIRCUIT OP07 CP	044007
MA5	**OP07 CP CIRCUIT INTEGRE AMPLI OP/** AMPLI OP INTEGRATED CIRCUIT OP07 CP	044007
MA6	**LM 317T REGULATEUR POSITIF TO 220 1A/** TO 220 1A POSITIVE REGULATOR LM 317T	033011
	CONNECTEURS/CONNECTORS	
J1	ANSLEY 609-2603	074902
J2	ANSLEY 609-2630	074904
J3	COMATEL PICOT REF. 5115600	090515
J4	COMATEL PICOT REF. 5115600	090515
J5	COMATEL PICOT REF. 5115600	090515
J7	COMATEL PICOT REF. 5115600	090515
J8	COMATEL PICOT REF. 5115600	090515
J9	COMATEL PICOT REF. 5115600	090515
J10	COMATEL PICOT REF. 5115600	090515
	DIVERS/MISCELLANEOUS	
	ANTITRACTION 609-2639/STRAIN RELIEF 609-2639	074910
	CABLE 700mm 26PTS 171-26/CABLE 700M 26PTS 171-26	160401
	SUPPORT J231808/SOCKET J231808	090701
	SUPPORT J2318016/SOCKET J2318016	090703



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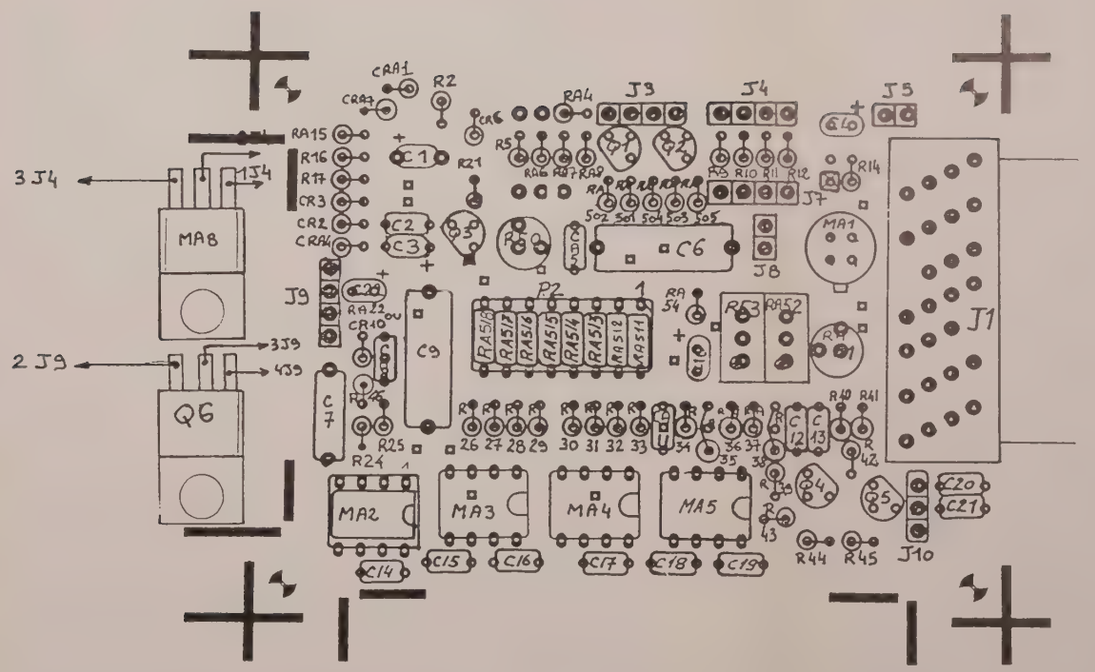
Dessin		Vérif. / Ing. / Date 15.6.87	Page 1/1	
GIGA INSTRUMENTATION 91401 ESSONNES FRANCE		COMMUNICATION REPRODUCTION ET UTILISATION INTERDITES		
		CARTE INTERFACE ALIMENTATION YIG	Type	Code C 50 3506



2	178	R24 décalée R46 ajoutée CI édit. 2	12-84	JR
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EDITION	MODIF N°	NATURE DE LA MODIFICATION		

COMMUNICATION ET UTILISATION INTERDITES — date 6-12-83

GIGA INSTRUMENTATION — dessin JPC; Vérif; Ingénieur

ALIMENTATION YIG
YIG BOX POWER SUPPLY

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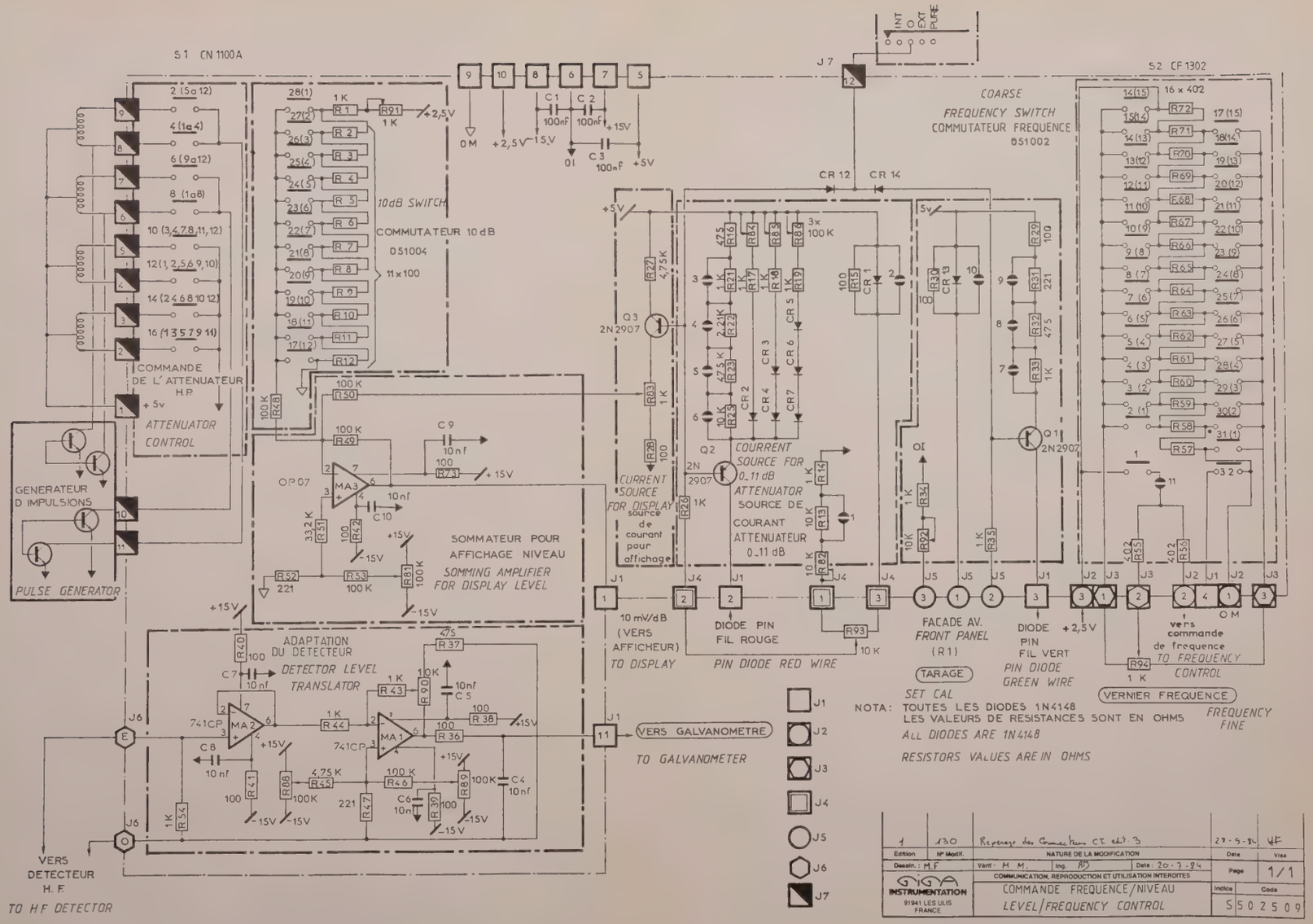

S1 CN 1100A
S2 CF 1302
J7
INT
EXT
PURE
COARSE
FREQUENCY SWITCH
COMMUTATEUR FREQUENCE
051002
10dB SWITCH
COMMUTATEUR 10 dB
051004
11 x 100
16 x 402
COMMANDE DE L'ATTENUATEUR H.F
ATTENUATOR CONTROL
GENERATEUR D IMPULSIONS
PULSE GENERATOR
SOMMATEUR POUR AFFICHAGE NIVEAU
SOMMING AMPLIFIER FOR DISPLAY LEVEL
CURRENT SOURCE FOR DISPLAY
source de courant pour affichage
COURRENT SOURCE FOR 0_11 dB ATTENUATOR
SOURCE DE COURANT ATTENUATEUR 0_11 dB
ADAPTATION DU DETECTEUR
DETECTOR LEVEL TRANSLATOR
10 mV/dB (VERS AFFICHEUR)
TO DISPLAY
DIODE PIN FIL ROUGE
PIN DIODE RED WIRE
FACADE AV.
FRONT PANEL
(R1)
DIODE PIN FIL VERT
PIN DIODE GREEN WIRE
+2,5V
OM
vers commande de frequence
TO FREQUENCY CONTROL
TARAGE
SET CAL
VERNIER FREQUENCE
FREQUENCY FINE
VERS GALVANOMETRE
TO GALVANOMETER
VERS DETECTEUR H.F.
TO HF DETECTOR
NOTA: TOUTES LES DIODES 1N4148
LES VALEURS DE RESISTANCES SONT EN OHMS
ALL DIODES ARE 1N4148
RESISTORS VALUES ARE IN OHMS
J1
J2
J3
J4
J5
J6
J7
GIGA INSTRUMENTATION
91941 LES ULIS FRANCE
COMMANDE FREQUENCE/NIVEAU
LEVEL/FREQUENCY CONTROL
S 5 0 2 5 0 9

7.5 FREQUENCY/LEVEL CONTROL (502509)

7.5.1 Frequency control

The YIG oscillator together with its control circuit (on the 501506 board) acts as a voltage -----> frequency converter. The frequency control of the 502509 board generates a control voltage proportional to the frequency. The value of this frequency is determined by the adjustment located on the front panel of the generator.
A reference + 2.5V power supplies a network of 16 resistors which selected two by two by the range switch, allows frequency adjustment by steps and supplies the R94 potentiometer ensuring the final adjustment.

7.5.2 Level control

The level and set attenuators are controlled by a current which determines, in function of its value, the attenuation by giving the PIN diodes the right dynamic resistor.

7.5.2.1 Control of the set attenuator

The set attenuator is applied by a source of positive and linear current ensuring the adjustment of the reference level.
The current source formed by the Q1 allows modification of the polarisation current of the set attenuator (3 of J1, green wire) when operating the set level control on the potentiometer. The Q1 dynamic range is adjusted by the R92 potentiometer and the different straps (7, 8 and 9) putting or not into service the R31 to R33 resistors.
When the functions switch is on "0", the cathode of the CR14 diode is located at the mass, leading to saturation of Q1 and afterwards to an attenuation of the maximum set level.

7.5.2.2 Control of the variable attenuator (0 to 11 dB)

The potentiometer of the variable attenuator control operates on two sources of current :

- A linear source formed by Q3, which allows readout of the level taking into account the attenuation caused by the step attenuator.

- A non-linear source with a voltage control formed by Q2 in order to linearize the attenuation/control voltage curve.

The current source made with Q3 generates a voltage proportional to the continuous level setting across R28 and R83 which supplies the MA3 sommation amplifier with information from the network of resistors of 10 dB steps. The R81 potentiometer compensates the MA3 offset. The correction of the voltage/current curve of the source formed with Q2 is carried out by accelerating the current variation as the control voltage increases ; the polarization current of the PIN diode increases progressively and the drop in voltage across the emitter resistor increases until the CR2 diode starts to conduct, accelerating the increase of the current (adjustment by R84). The CR37 and CR4 then begin to drive (adjustment by R85) followed by CR5, CR6 and CR7 (adjustment by R86). When the function switch is on "0", the cathode of the CR12 diode is at ground level, producing saturation of Q2 and then a maximum attenuation of the level.

7.5.2.3 Control of the attenuator by steps

The attenuator by steps is made up of four cells of respectively 10 dB, 20 dB, 40 dB and 40 dB, which in combination attenuate the signal from 0 to 110 dB by steps of 10 dB.
Each cell is controlled by a relay. The coil has a middle point connected to the + 5V. The earthing (0V) of either end of the coil determines whether or not the corresponding attenuation cell put into service.
When the functions switch is on any other position than "0", the Q4 and Q5 transistors are blocked while the Q6 and Q7 are saturated (see the schematic of the pulse generator, mother board 502510). Level "1" is thus applied to 6 and 8 of J7 and level "0" to 10 and 11 of J7.

These features validate the level control ; the rotation of the level switch determines the state of contacts 2, 4, 6, 14 and 16 and consequently the attenuation value. The minimum attenuation of 0 dB corresponds to position 12, 10 dB to position 11 and 110 dB to position 1.
Inversely, when the functions switch is on "0", Q4 and Q5 are saturated and Q6 and Q7 are blocked. This produces the application of a "0" level to 6 and 8 of J7 and a level "1" to 10 and 11 of J7. The two 40 dB cells are thus automatically put into service giving an attenuation of 80 dB.

7.5.3 Adaptation of the detector

This assembly fed by the "0 dBm CAL" input triggers the lighting up of the central segment of the galvanometer (see board 511503) by supplying a power of 50 mV when the level present at the "0 dBm CAL" input is 0 dBm. A detector integrated into the "0 dBm CAL" input feeds an adaptation amplifier (MA2) and a second amplifier with a double adjustment of offset voltage (R88, R89) which give 50 mV at this output (for 0 dBm at the input of the calibrator). The gain adjustment by R90 allows the adjustment of the sensitivity of the galvanometer so that the central segment stays lit up for a variation of ± 0.1 dB.

NOTE : For the GR 1318 model the central segment of the galvanometer lights up for a level of -10 dBm.

SERIE/SERIES
GR

COMMANDE FREQUENCE/NIVEAU (502509-1)
LEVEL/FREQUENCY CONTROL

REF	DESCRIPTION	CODE GIGA GIGA PART NR
	CIRCUIT IMPRIME/PRINTED CIRCUIT	080401
	RESISTANCES/RESISTORS	
R1	1K 1% 1/4W 50ppm	311100
R2	100Ω 1% 1/4W 50ppm	310100
R3	100Ω 1% 1/4W 50ppm	310100
R4	100Ω 1% 1/4W 50ppm	310100
R5	100Ω 1% 1/4W 50ppm	310100
R6	100Ω 1% 1/4W 50ppm	310100
R7	100Ω 1% 1/4W 50ppm	310100
R8	100Ω 1% 1/4W 50ppm	310100
R9	100Ω 1% 1/4W 50ppm	310100
R10	100Ω 1% 1/4W 50ppm	310100
R11	100Ω 1% 1/4W 50ppm	310100
R12	100Ω 1% 1/4W 50ppm	310100
R13	10K 1% 1/4W 50ppm	312100
R14	1K 1% 1/4W 50ppm	311100
R15	100Ω 1% 1/4W 50ppm	310100
R16	475Ω 1% 1/4W 50ppm	310475
R17	1K 1% 1/4W 50ppm	311100
R18	1K 1% 1/4W 50ppm	311100
R19	1K 1% 1/4W 50ppm	311100
R21	1K 1% 1/4W 50ppm	311100
R22	2,21K 1% 1/4W 50ppm	311221
R23	4,75K 1% 1/4W 50ppm	311475
R25	10K 1% 1/4W 50ppm	312100
R26	1K 1% 1/4W 50ppm	311100
R27	4,75K 1% 1/4W 50ppm	311475
R28	100Ω 1% 1/4W 50ppm	310100
R29	100Ω 1% 1/4W 50ppm	310100
R30	100Ω 1% 1/4W 50ppm	310100
R31	221Ω 1% 1/4W 50ppm	310221
R32	475Ω 1% 1/4W 50ppm	310475
R33	1K 1% 1/4W 50ppm	311100
R36	100Ω 1% 1/4W 50ppm	310100
R37	475Ω 1% 1/4W 50ppm	310475
R38	100Ω 1% 1/4W 50ppm	310100
R39	100Ω 1% 1/4W 50ppm	310100
R40	100Ω 1% 1/4W 50ppm	310100
R41	100Ω 1% 1/4W 50ppm	310100
R42	100Ω 1% 1/4W 50ppm	310100
R43	1K 1% 1/4W 50ppm	311100
R44	1K 1% 1/4W 50ppm	311100
R45	4,75K 1% 1/4W 50ppm	311475
R46	100K 1% 1/4W 50ppm	313100
R47	221Ω 1% 1/4W 50ppm	310221

SERIE/SERIES
GR

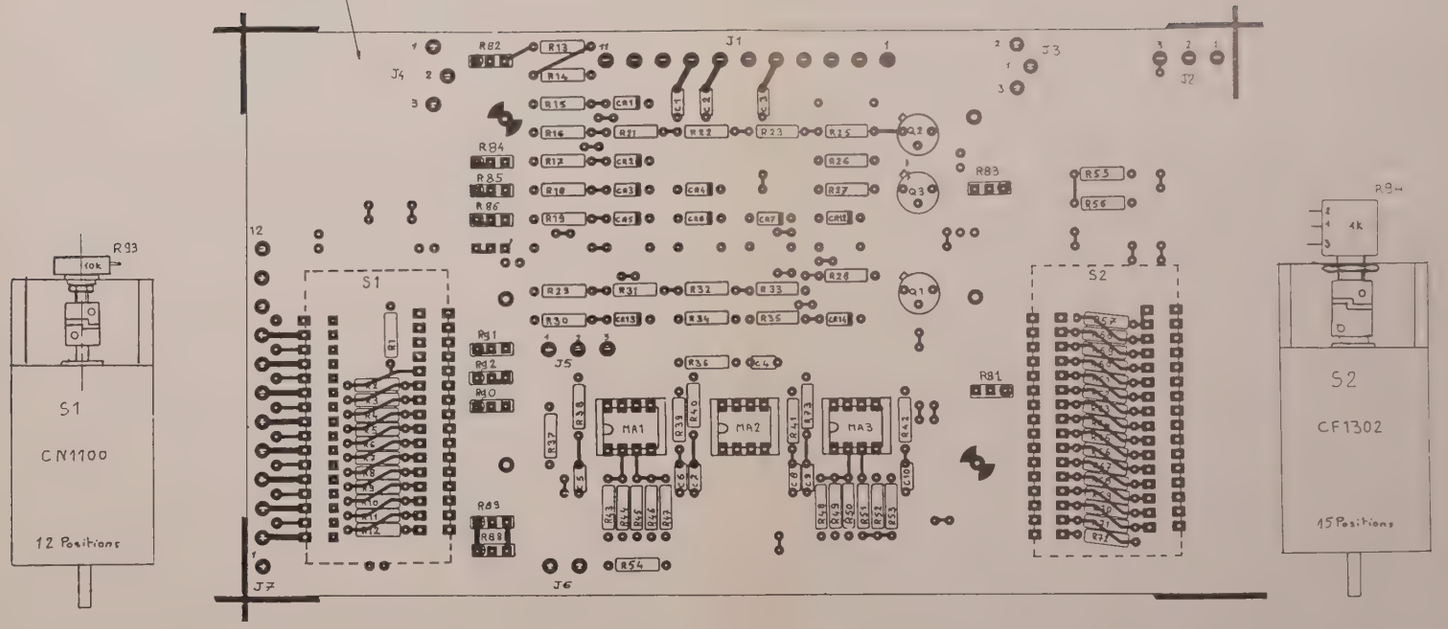
COMMANDE FREQUENCE/NIVEAU (502509-1)
LEVEL/FREQUENCY CONTROL

REF		DESCRIPTION	CODE GIGA GIGA PART NR
R48	100K	1% 1/4W 50ppm	313100
R49	100K	1% 1/4W 50ppm	313100
R50	100K	1% 1/4W 50ppm	313100
R51	33,2K	1% 1/4W 50ppm	312332
R52	221Ω	1% 1/4W 50ppm	310221
R53	100K	1% 1/4W 50ppm	313100
R54	1K	1% 1/4W 50ppm	311100
R55 à R72	402Ω	1% 1/4w 50ppm	310402
		DIODES	
CR1	1N4148		031005
CR2	1N4148		031005
CR3	1N4148		031005
CR4	1N4148		031005
CR5	1N4148		031005
CR6	1N4148		031005
CR7	1N4148		031005
CR8	1N4148		031005
CR9	1N4148		031005
CR10	1N4148		031005
CR11	1N4148		031005
CR12	1N4148		031005
CR13	1N4148		031005
CR14	1N4148		031005
		POTENTIOMETRES/POTENTIOMETERS	
R81	100K	64W 104	112410
R82	10K	64W 103	112310
R83	1K	64W 102	112210
R84	100K	64W 104	112410
R85	100K	64W 104	112410
R86	100K	64W 104	112410
R88	100K	64W 104	112410
R89	100K	64W 104	112410
R90	10K	64W 103	112310
R91	1K	64W 102	112210
R92	10K	64W 103	112310
		CONDENSATEURS/CAPACITORS	
C1	100nF	BX104	025410
C2	100nF	BX104	025410
C3	100nF	BX104	025410
C4	10nF	BX103	025310
C5	10nF	BX103	025310
C6	10nF	BX103	025310
C7	10nF	BX103	025310
C8	10nF	BX103	025310
C9	10nF	BX103	025310
C10	10nF	BX103	025310

SERIE/SERIES
GR

COMMANDE FREQUENCE/NIVEAU (502509-1)
LEVEL FREQUENCY CONTROL

REF	DESCRIPTION	CODE GIGA GIGA PART NR
	TRANSISTORS	
Q1	2N2907A	032007
Q2	2N2907A	032007
Q3	2N2907A	032007
	CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MA1	UA741 CP	044008
MA2	UA741 CP	044008
MA3	OP07	044007
J1 à J7	DF929	090502
R93	10K PIITYM Axe court	114310
R94	1K 10 tours 534	116002
S1	CN1100A	091004
S2	CF1302	091002



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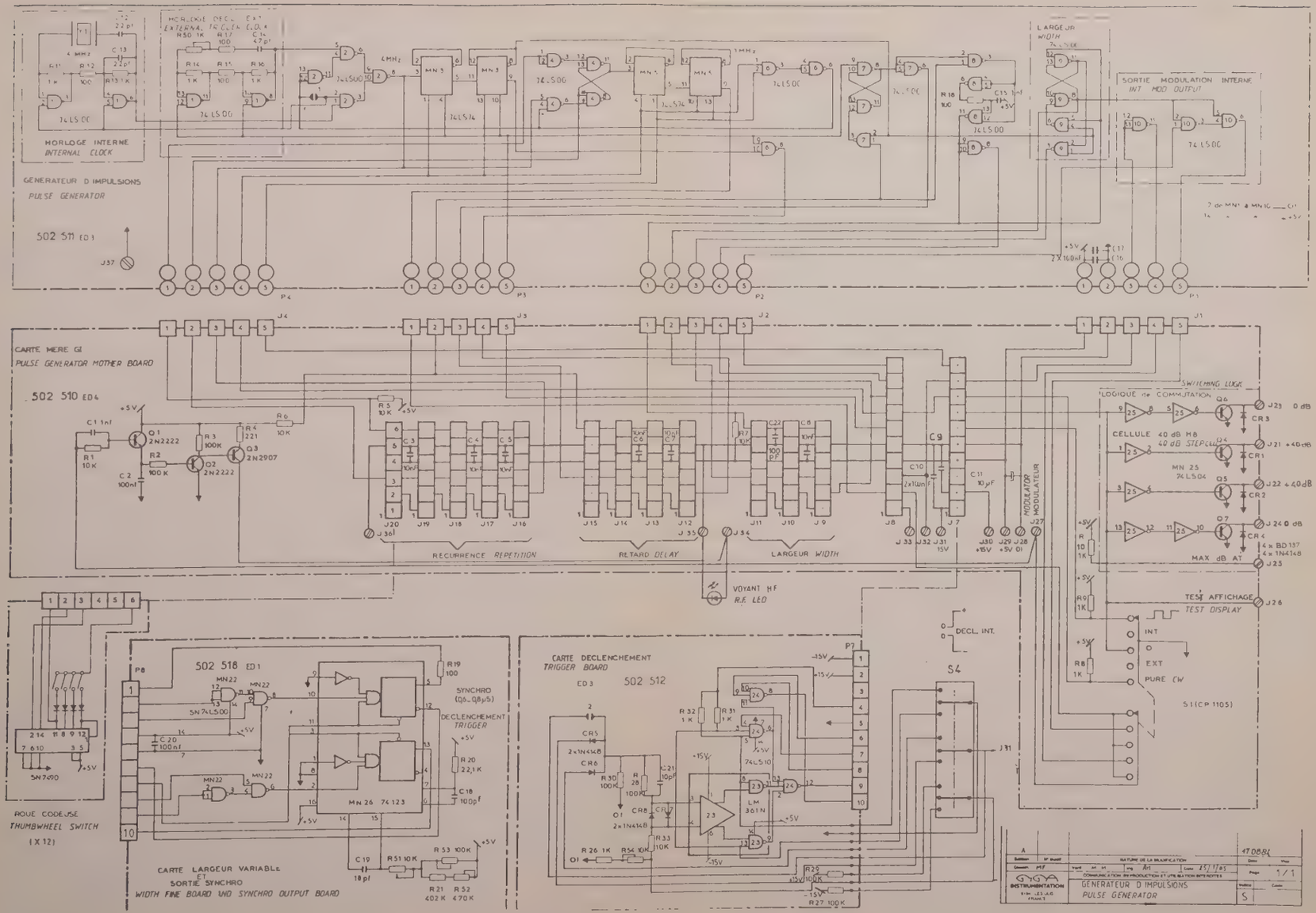
GIGA INSTRUMENTATION 91941 LES ULIS FRANCE	COMMUNICATION, REPRODUCTION ET UTILISATION INTERDITES		Indice / Code
	COMMANDE FREQUENCE/NIVEAU LEVEL/FREQUENCY CONTROL		C 502506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PULSE GENERATOR MOTHER BOARD
502 510 ED4
LOGIQUE DE COMMUTATION
SWITCHING LOGIC
CELLULE 40 dB MB
40 dB STEP CELL
MN 25
74LS04
MAX dB AT
TEST AFFICHAGE
TEST DISPLAY
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S1 (CP 1105)
MODULATEUR
MODULATOR
RECURRENCE REPETITION
RETARD DELAY
LARGEUR WIDTH
VOYANT HF
R.F. LED
DECL. INT.
S4
ROUE CODEUSE
THUMBWHEEL SWITCH
(X 12)
502 518 ED1
SYNCHRO
(Q6..Q8,p5)
DECLENCHEMENT
TRIGGER
CARTE LARGEUR VARIABLE
ET
SORTIE SYNCHRO
WIDTH FINE BOARD AND SYNCHRO OUTPUT BOARD
CARTE DECLENCHEMENT
TRIGGER BOARD
502 512 ED3
INSTRUMENTATION
GENERATEUR D IMPULSIONS
PULSE GENERATOR

7.6 PULSE GENERATOR

This function is distributed on four boards ;

- Pulse generator board (502511)

- Variable width and synchro output board (502511)

- Trigger board (502512)

In addition, the thumbwheels assembly (502519)

7.6.1 Pulse generator board (502511)

The different parameters, multiples of the microsecond, are determined from a 4 MHz frequency. This frequency can be generated by two oscillators built around the MN1 circuit.

- A fixed quartz oscillator for internal square modulation or internal pulse modulation by internal trigger.

- A RC oscillator the frequency of which is determined by C14, R17 and R50 for internal modulation by external trigger.
The R50 potentiometer is used to adjust the frequency to the same value as that of the quartz oscillator.

The quartz oscillator works as a free oscillator while the other is synchronized at each external trigger pulse by the signal delivered in 12 of MN26 (dual monostable on board 502518).
The selection of one or of the other is carried out by MN2. It is followed by a double divider by two (MN3) which produces a 1 MHz signal to supply the delay and width counters. The delay counters are fed by 4 MHz ; the frequency of the output signal is then divided by 4 (MN5), the square signal obtained is used for the internal square modulation.

The MN4 integrated circuit generates the reset pulse of the repetition counters. The synchronization pulse (12 MN 26 on board 502518) controls the start of the delay count via the detection circuit carried out by MN7. The end of the count causes a pulse (MN8) which starts the width count via the detection circuit carried out by MN9.

The selection of the modulation signal is carried out by the functions switch. Its output drives the modulator, the " ⎍⎍ " output on the rear panel and a control circuit producing the lighting up of the RF led (on the board 502510).

7.6.2 Variable width and synchro output board (502518)

The MN26 circuit is composed of two monostables ; the first issues the synchronization pulse of fixed width, lower than 1 µs, in order to be compatible with repetition frequencies up to 1 MHz. The time constant is carried out by R20 and C18. This signal is available on the synchro output on the front panel (output 5 of MN26). The other monostable output (12 of MN26) is directed onto board 502511 to synchronize the RC oscillator (in internal modulation by external trigger) and to control the start of the delay count. The selection of the trigger mode (internal or external) is carried out by 2 NAND gates of MN22.

The second MN26 monostable allows the temporization, adjustable progressively by a potentiometer, lower than one microsecond which is added to the numerical time of the width, multiple of the microsecond by MN10 (board 502511).

7.6.3 Trigger board (502512)

The aim of this board is to convert the level of the trigger signal into a TTL level. A MN23 rapid comparator is positive or negative voltage polarized according to the position of the toggle switch on the front panel in order to turn onto the selected polarity.
The adjustment of the trigger threshold is carried out by R54. The CR5 and CR6 diodes ensure protection for the inverse polarity signal and can be jumped in order to increase sensitivity input or for external modulation with very narrow pulses if these pulses do not present any inverse voltage.
The CR7 and CR8 diodes ensure protection of the input of the comparator. The MN24 circuit, a three inputs NAND gate, allows selection of the correct output of the comparator in relation to the selected polarity.
In addition, this circuit gives information to certain integrated circuits of the pulse generator 502511 according to the position of the "FUNCTIONS" switch and of the toggle switch of the trigger polarity.

7.6.4 Mother board (502510)

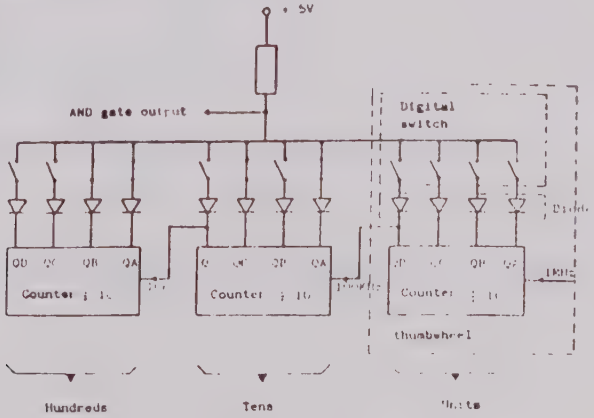
This board is composed of several connectors on which the other boards of the pulse generator are plugged in as well as the thumbwheels elements and the functions switch.
The circuit of the RF led control built with three transistors Q1, Q2 and Q3 is directly controlled by the modulator control signal. For a high level or a pulse (modulator in service), the capacitor C2 is rapidly charged by the Q1 transistor thus making Q2 and Q3 transistors into conduction and lighting up the RF led.

The commutation logic allows validation of the level control when the functions switch is on any position except zero.
This logic allows attenuation of the level at 80 dB when the switch is on "0" (see paragraph 7.5.2.3).

7.6.5 Thumbwheel assembly (502519)

Each element of the thumbwheel includes a four diode numerical contact and a counter.
The counters are assembled in cascade for each group of thumbwheels. The first counter and its associated thumbwheel corresponds to the lowest figure. It is supplied by a 4 MHz clock signal for repetition and a 1 MHz clock signal for delay and width pulse. As the counters are programmed to divide by 10, the QD output (Pin 11) which corresponds to the MSB (most significant bit) increases the following counter with a frequency that is 10 times smaller. This happens as many times as there are thumbwheels by group.
Each numerical contact is linked to the outputs of the counter by an ET gate built by four diodes. The value programmed in µs is transmitted in the form of a binary word coded in decimals (BCD) on the anodes of the diodes. A closed switch determines an active level "1" and a level "0" when it is open.

EXAMPLE : A selected pulse width of 350 µs gives the following schematic.



After a certain time, when the counter has been increased by N clock cycles, equivalent to the figure selected by the thumbwheels, the switches BCD outputs of the counters will pass from level "0" to level "1". This will determine the end of the count of the width of the pulse (as in the example above) of the delay or of the repetition.

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
CARTE GENERATEUR D'IMPULSIONS/PULSE GENERATOR BOARD		(502511- 3)
	CIRCUIT IMPRIME/PRINTED CIRCUIT	081201
	RESISTANCES/RESISTORS	
R11	1k 1% 1/4W 50ppm	311100
R12	100 1% 1/4W 50ppm	310100
R13	1K 1% 1/4W 50ppm	311100
R14	1K 1% 1/4W 50ppm	311100
R15	100 1% 1/4W 50ppm	310100
R16	1K 1% 1/4W 50ppm	311100
R17	100 1% 1/4W 50ppm	310100
R18	100 1% 1/4W 50ppm	310100
	CONDENSATEURS/CAPACITORS	
C12	22pF CK05 BX 220 100V	025022
C13	22pF CK05 BX 220 100V	025022
C14	47pF CK05 BX 470 100V	025047
C15	1nF CK05 BX 210 100V	025210
C16	100nF CK05 BX 210 100V	025410
C17	100nF CK05 BX 210 100V	025410
	POTENTIOMETRES/POTENTIOMETERS	
R50	1K 64X 102	111210
	CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MN1	74LS 00N	043001
MN2	74LS 00N	043001
MN3	74LS 74AN	043004
MN4	74LS 00N	043001
MN5	74LS 74AN	043004
MN6 à/to MN10	74LS 00N	043001

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
CARTE	GENERATEUR D'IMPULSIONS/PULSE GENERATOR BOARD	(502511- 3)
	CONNECTEURS/CONNECTORS	
P1 à/to P4	CIH 5 RCBR 254	071212
	DIVERS/MISCELLANEOUS	
Y1	4 MHz 4093 QUARTZ/CRISTAL	034001
XMN1 à/to XMN10	SUPPORT CI 14 BROCHES/CI SOCKETS 14PINS	090702
3 POINTS DE TEST DF 929/3 TEST POINTS DF 929		090502

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CARTE LARGEUR VARIABLE ET SORTIE SYNCHRO (502518-1) WIDTH FINE BOARD AND SYNCHRO OUTPUT BOARD	
	CIRCUIT IMPRIME/PRINTED CIRCUIT	080106
	RESISTANCES/RESISTORS	
R19	100 1% 1/4W 50ppm	310100
R20	22,1K 1% 1/4W 50ppm	312221
R21	402k 1% 1/4W 50ppm	313402
	CONDENSATEURS/CAPACITORS	
C18	100pF CK 05 BX 101 100V	025110
C19	18pF CK 05 BX 180 100V	025018
C20	100nF CK 05 BX 104 100V	025410
	POTENTIOMETRES/POTENTIOMETERS	
R51	10K 64W 103	112310
R52	470K 64X 474	111447
R53	100K P11TYR	115410
	CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MN22	SN 74LS 00	043001
MN26	SN 74LS 123N	042004
	CONNECTEURS/CONNECTORS	
P8	CIP 10 RCBR 254	071319
	DIVERS/MISCELLANEOUS	
XMN 22	SUPPORT CI 14 BROCHES/CI SOCKET 14 PINS	090702
XMN 26	SUPPORT CI 18 BROCHES/CI SOCKET 18 PINS	090703

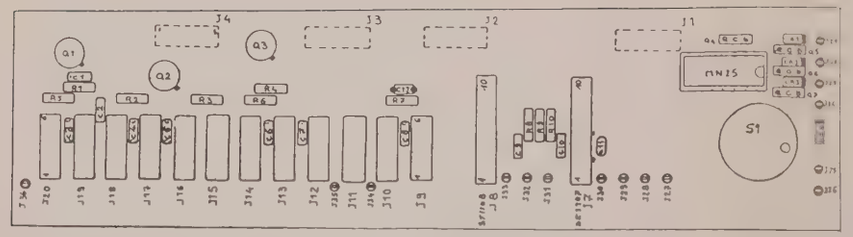
REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CARTE DECLENCHEMENT /TRIGGER BOARD (502512-3)	
	CIRCUIT IMPRIME /PRINTED CIRCUIT	080901
	RESISTANCES/RESISTORS	
R26	1K 1% 1/4W 50ppm	311100
R27	100K 1% 1/4W 50ppm	313100
R28	100K 1% 1/4W 50ppm	313100
R29	100K 1% 1/4W 50ppm	313100
R30	100K 1% 1/4W 50ppm	313100
R31	1K 1% 1/4W 50ppm	311100
R32	1K 1% 1/4W 50ppm	311100
R33	10K 1% 1/4W 50ppm	312100
	CONDENSATEUR/CAPACITOR	
C21	10pF CK 05 BX 100 100V	025010
	POTENTIOMETRE/POTENTIOMETER	
R54	10K T7 YB	113310
	DIODES	
CR5	1N4148	031003
CR6	1N4148	031003
CR7	1N4148	031003
CR8	1N4148	031003
	CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MN 23	LM361N	047008
MN 24	74LS10N	043003

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CARTE DECLENCHEMENT /TRIGGER BOARD (502512-3)	
	CONNECTEUR/CONNECTOR	
P7	CIP 10 RCBR 254	071319
	DIVERS/MISCELLANEOUS	
S4	INVERSEUR 3C 3P TA 6303/SWITCH 3C 3P TA 6303	052007
XMN23	SUPPORT CI, 14 BROCHES/C1 SICKET14 PINS	090702
XMN24	SUPPORT CI, 14 BROCHES/CI SOCKET 14 PINS	090702

REF.		DESCRIPTION	CODE GIGA GIGA PART NR
		CARTE MERE/MOTHER BOARD (502510-4)	
		CIRCUIT IMPRIME/PRINTED CIRCUIT	080801
		RESISTANCES/RESISTORS	
R1	10K	1% 1/4W 50ppm	312100
R2	100K	1% 1/4W 50ppm	313100
R3	100K	1% 1/4W 50ppm	313100
R4	221	1% 1/4W 50ppm	310221
R5	10K	1% 1/4W 50ppm	312100
R6	10K	1% 1/4W 50ppm	312100
R7	10K	1% 1/4W 50ppm	312100
R8	1K	1% 1/4W 50ppm	311100
R9	1K	1% 1/4W 50ppm	311100
R10	1K	1% 1/4W 50ppm	311100
		CONDENSATEURS/CAPACITORS	
C1	1nF	CK05 BX102 100V	025210
C2	100nF	CK05 BX104 100V	025410
C3	10nF	CK05 BX103 100V	025310
C4	10nF	CK05 BX103 100V	025310
C5	10nF	CK05 BX103 100V	025310
C6	10nF	CK05 BX103 100V	025310
C7	10nF	CK05 BX103 100V	025310
C8	10nF	CK05 BX103 100V	025310
C9	100nF	CK05 BX104 100V	025410
C10	100nF	CK05 BX104 100V	025410
C11	10µF	TANTALE GOUTTE 35V/TANTALUM DROP 35V	023610
C22	100pF	CK05 BX101	025110
		DIODES	
CR1	1N4148		031003
CR2	1N4148		031003
CR3	1N4148		031003
CR4	1N4148		031003

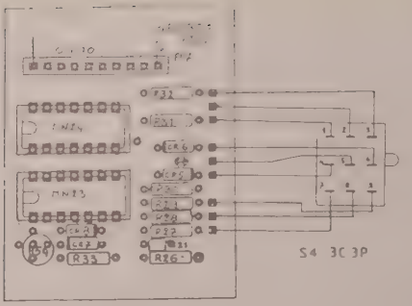
REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CARTE MERE/MOTHER BOARD (502510-4)	
	TRANSISTORS	
Q1	2N2222	032006
Q2	2N2222	032006
Q3	2N2907	032007
Q4	BD 137	032010
Q5	BD 137	032010
Q6	BD 137	032010
Q7	BD 137	032010
	CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MN 25	74 LS 04N	043002
	CONNECTEURS/CONNECTORS	
J1 à/to J4	SCD5 RCBR 254	071101
J7, J8	SCD10 RCBR 254	071103
J9 à/to J20	SCD6 RCBR 254	071102
	DIVERS/MISCELLANEOUS	
XMN 25	SUPPORT CI 14 BROCHES/CI SOCKET 14 PINS	090702
S1	CP 1105 COMMUTATEUR SUBMINI/SUBMINI SWITCH	051006

REF	DESCRIPTION	CODE GIGA GIGA PART NR
	ENSEMBLE ROUES CODEUSES/THUMBWHEELS SET (502519)	
8	ROUES CODEUSES NOIRES CS 924/8 BLACK THUMBWHEELS CS 924	053001
4	ROUES CODEUSES GRISES CS 924/4 GREW THUMBWHEELS CS 924	053002
2	JOUES LATERALES NOIRES A 900.01/2 BLACK LATERAL SIDES a 900.01	053003



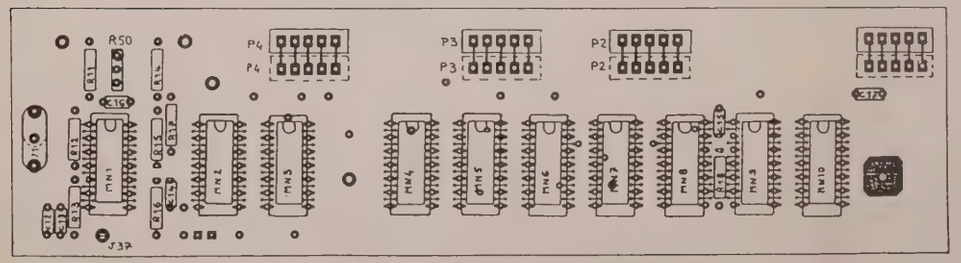
CARTE DE BASE (C 502510 - 4)

MOTHER BOARD



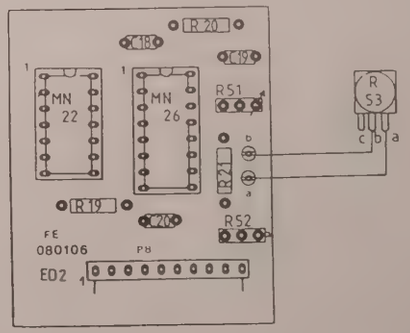
CIRCUIT DE DECLENCHEMENT (C 502512 - 3)

TRIGGER BOARD



GENERATEUR D'IMPULSIONS (C 502511 - 3)

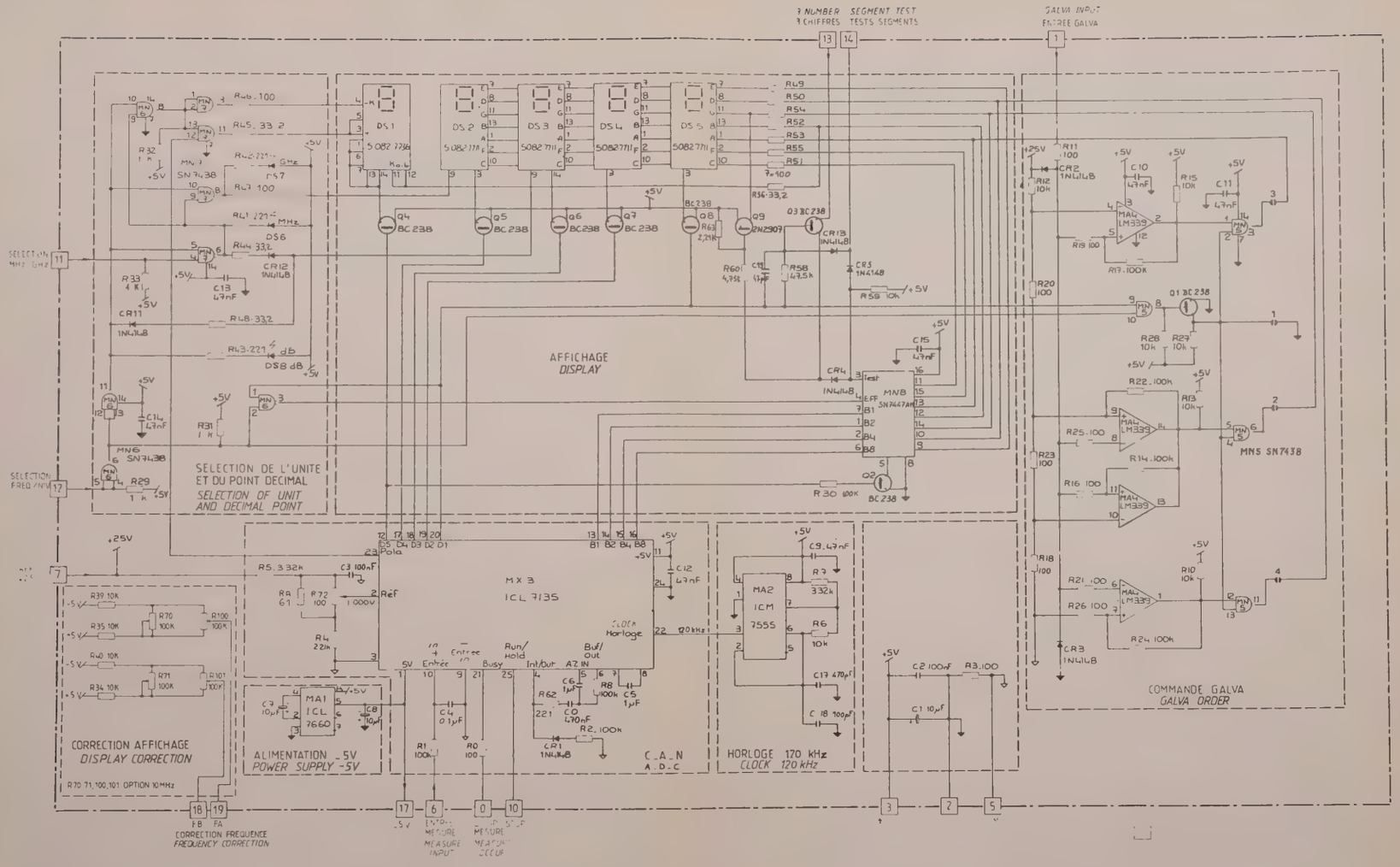
PULSE GENERATOR BOARD



CIRCUIT SYNCHRO/LARGEUR (C 502518 - 1)

WIDTH FINE AND SYNCHRO OUTPUT BOARD

A			17 08 86	
Edition	N° Visa	NATURE DE LA MODIFICATION	Date	Visa
Dessin MF	Vérif. M M	Vig. AM Date 15/7/85	Page	1/1
GYSA INSTRUMENTATION 91941 LES ULIS FRANCE	COMMUNICATION REPRODUCTION ET UTILISATION INTERDITES		Indice	Cartes
	GENERATEUR D IMPULSIONS PULSE GENERATOR		C	


7 NUMBER SEGMENT TEST
7 CHIFFRES TESTS SEGMENTS
GALVA INPUT
ENTREE GALVA
SELECTION MHz GHz
SELECTION FREQ/NIV
AFFICHAGE
DISPLAY
SELECTION DE L'UNITE ET DU POINT DECIMAL
SELECTION OF UNIT AND DECIMAL POINT
MX 3
ICL 7135
CORRECTION AFFICHAGE
DISPLAY CORRECTION
R70 71,100,101 OPTION 10MHz
ALIMENTATION -5V
POWER SUPPLY -5V
HORLOGE 170 kHz
CLOCK 120 kHz
COMMANDE GALVA
GALVA ORDER
CORRECTION FREQUENCE
FREQUENCY CORRECTION
MNS SN7438

7.7 LOCAL DISPLAY (511503)

The analogical numerical conversion of the frequency or of the level is carried out by the MX3 integrated circuit. Its input receives either the 10 mV/MHz signal or the 100 mV/GHz signal from the 501506 board, or the 10 mV/dB signal from the 502509 board, depending on the selection made on the front panel.
The clock frequency of the CAN fixed at 120 KHz is carried out by the MA2 circuit, assembled as a free oscillator. The voltage reference is obtained by dividing the 2.5 V from the 501506 board.
The gain adjustment is made by the R72 potentiometer. The operation of CAN requires a negative voltage, -5V, this being carried out by MA1, a regulator which inverses the + 5V voltage.
The BCD informations delivered at the output are decoded by MN18 and let towards the seven segment readout. The multiplexage informations control the anodes of the display via the Q4-Q8 transistors.
The "NAND" logical gates contained in the MN6 and MN7 circuit allow selection of the unity, the decimal point and the polarity (level readout).

When the level measurement is selected, the MN8 integrated circuit controls the erasing of the lowest figure with the "blanking" input (pin 4 of the circuit).
In addition, when the frequency is displayed in MHz, a "3 number" order delivered in 13 of J1 controls the readout of the lowest figure to 0, via the MN8 integrated circuit and the Q3 and Q4 transistors.
The control signal of the galvanometer (11 of J1 on board 502509) is compared at different voltage values determined by R12, R20, R23 and R18 network. Four comparators control the MN5 circuit ("NAND" gate with open collector) in order to light up the segment corresponding to the level of the input signal.

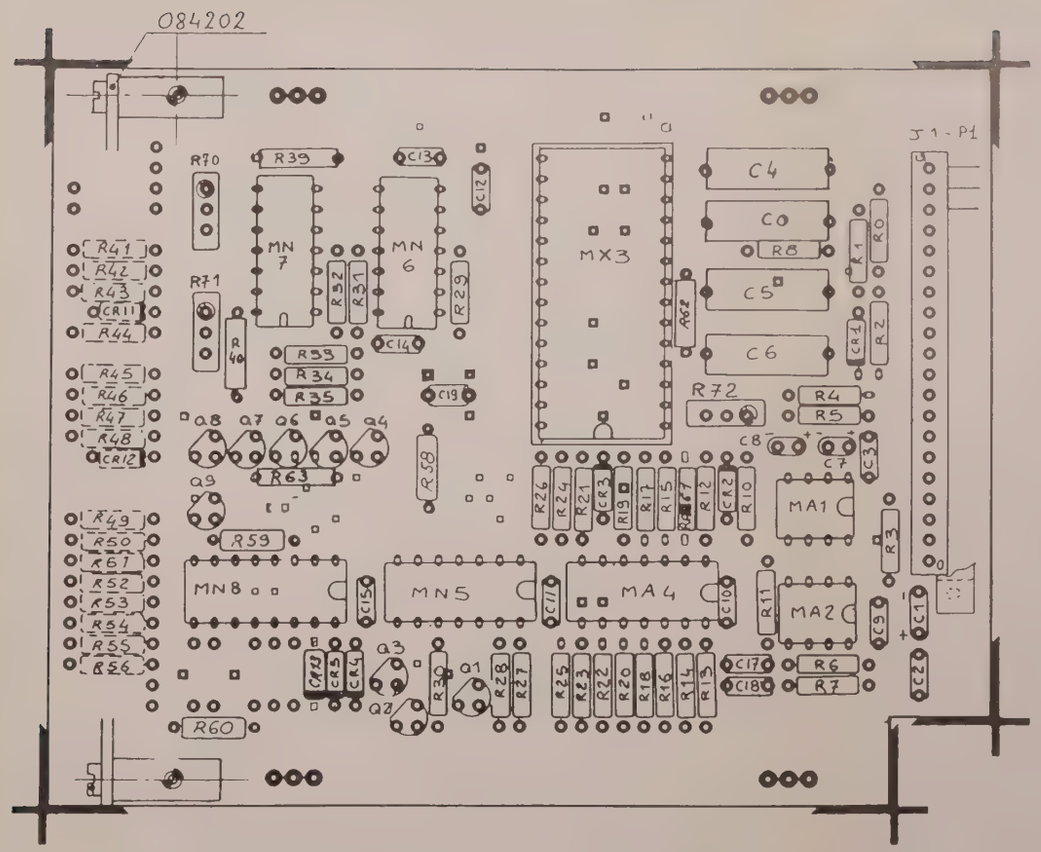
REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	CIRCUIT IMPRIME/PRINTED CIRCUIT	
	RESISTANCES/RESISTORS	
R0	100 1% 1/4W 50ppm	310100
R1	100K 1% 1/4W 50ppm	313100
R2	100K 1% 1/4W 50ppm	313100
R3	100 1% 1/4W 50ppm	310100
R4	2,21K 1% 1/4W 50ppm	311221
R5	3,32K 1% 1/4W 50ppm	311332
R6	10K 1% 1/4W 50ppm	312100
R7	3,32K 1% 1/4W 50ppm	311332
R8	100K 1% 1/4W 50ppm	313100
R10	10K 1% 1/4W 50ppm	312100
R11	100 1% 1/4W 50ppm	310100
R12	10K 1% 1/4W 50ppm	312100
R13	10K 1% 1/4W 50ppm	312100
R14	100K 1% 1/4W 50ppm	313100
R15	10K 1% 1/4W 50ppm	312100
R16	100 1% 1/4W 50ppm	310100
R17	100K 1% 1/4W 50ppm	313100
R18	100 1% 1/4W 50ppm	310100
R19	100 1% 1/4W 50ppm	310100
R20	100 1% 1/4W 50ppm	310100
R21	100 1% 1/4W 50ppm	310100
R22	100K 1% 1/4W 50ppm	313100
R23	100 1% 1/4W 50ppm	310100
R24	100K 1% 1/4W 50ppm	313100
R25	100 1% 1/4W 50ppm	310100
R26	100 1% 1/4W 50ppm	310100
R27	10K 1% 1/4W 50ppm	312100
R28	10K 1% 1/4W 50ppm	312100
R29	1K 1% 1/4W 50ppm	311100
R30	100K 1% 1/4W 50ppm	313100
R31	1K 1% 1/4W 50ppm	311100
R32	1K 1% 1/4W 50ppm	311100
R33	1K 1% 1/4W 50ppm	311100
R34	10K 1% 1/4W 50ppm	312100
R35	10K 1% 1/4W 50ppm	312100
R39	10K 1% 1/4W 50ppm	312100
R40	10K 1% 1/4W 50ppm	312100
R41	221 1% 1/4W 50ppm	310221
R42	221 1% 1/4W 50ppm	310221
R43	221 1% 1/4W 50ppm	310221

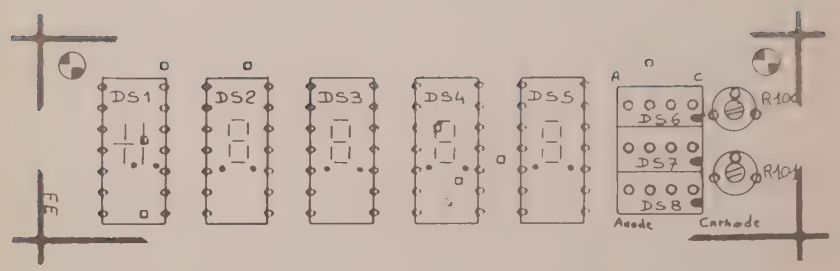
REF.		DESCRIPTION	CODE GIGA GIGA PART NR
R44	33,2	1% 1/4W 50ppm	310033
R45	33,2	1% 1/4W 50ppm	310033
R46	100	1% 1/4W 50ppm	310100
R47	100	1% 1/4W 50ppm	310100
R48	33,2	1% 1/4W 50ppm	310033
R49	100	1% 1/4W 50ppm	310100
R50	100	1% 1/4W 50ppm	310100
R51	100	1% 1/4W 50ppm	310100
R52	100	1% 1/4W 50ppm	310100
R53	100	1% 1/4W 50ppm	310100
R54	100	1% 1/4W 50ppm	310100
R55	100	1% 1/4W 50ppm	310100
R56	33,2	1% 1/4W 50ppm	310033
R58	47,5K	1% 1/4W 50ppm	312475
R59	10K	1% 1/4W 50ppm	312100
R60	47,5K	1% 1/4W 50ppm	312475
R62	22,1	1% 1/4W 50ppm	310022
R63	22,1K	1% 1/4W 50ppm	311221
		DIODES	
CR1	1N4148		031003
CR2	1N4148		031003
CR3	1N4148		031003
CR4	1N4148		031003
CR5	1N4148		031003
CR11	1N4148		031003
CR12	1N4148		031003
CR13	1N4148		031003
		CODENSATEURS/CAPACITORS	
C0	470nF	CKM 501 40V	022610
C1	10µF	TANTALE GOUTTE 35V/TANTALUM DROP 35V	023610
C2	100nF	CKo5 BX104 100V	025410
C3	100nF	CKo5 BX104 100V	025410
C4	0,1uF	SP 415 160V	022410
C5	1uF	SP 415 160V	022510
C6	1uF	SP 415 160V	022510
C7	10µF	TANTALE GOUTTE 35V/TANTALUM DROP 35V	023610
C8	10µF	TANTALE GOUTTE 35V/TANTALUM DROP 35V	023610
C9 à C15	47nF	CK 05 BX473 100V	025347
C17	470pF	CK 05 BX471 100V	025147
C18	100pF	CK 05 BX101 100V	025110
		POTENTIOMETRE/POTENTIOMETER	
R72	64W101		112110

SERIE/SERIES
GU/GS/GR

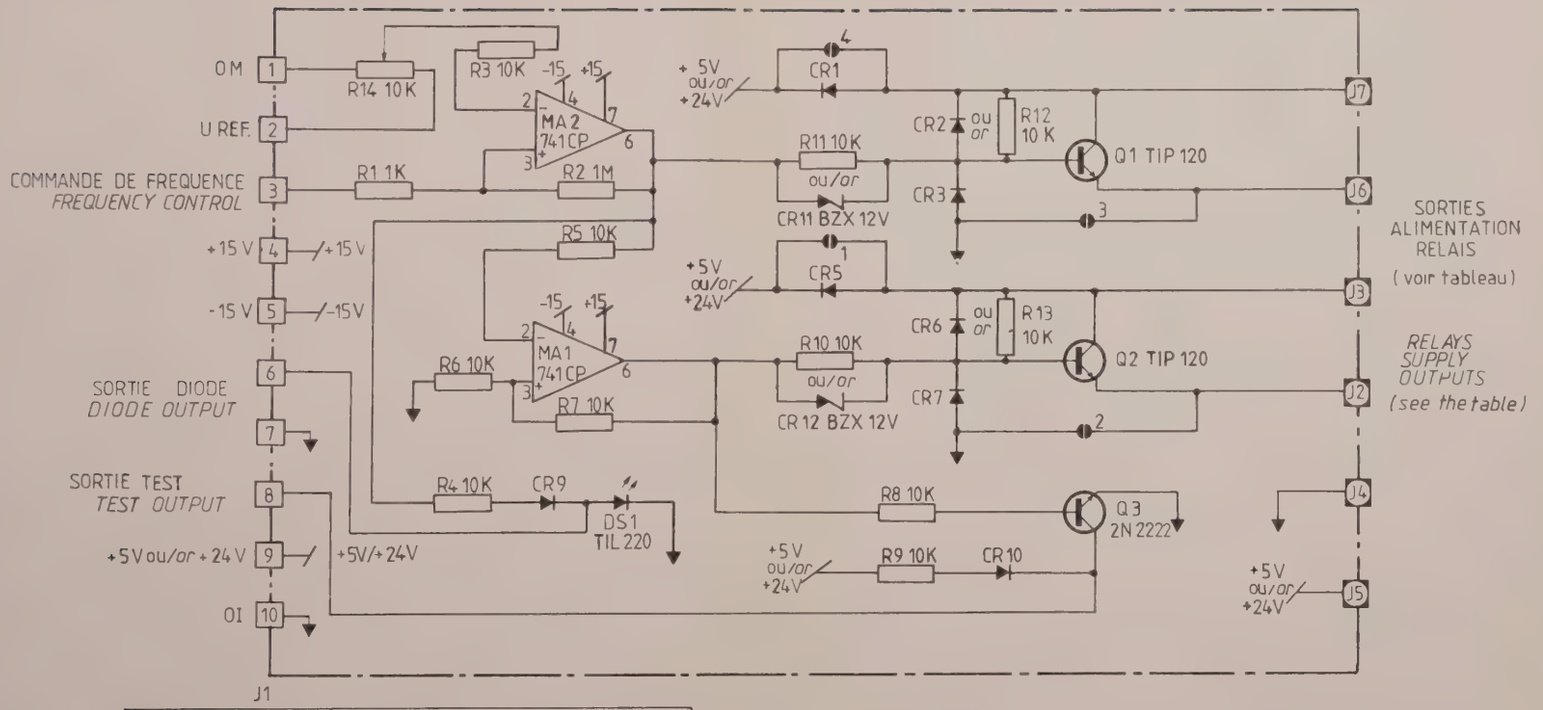
CARTE AFFICHAGE LOCAL (511503-10)
LOCAL DISPLAY BOARD

REF.	DESCRIPTION	CODE GIGA GIGA PART NR
	TRANSISTORS	
Q1 à Q8	BC 238	032001
Q9	2N 2907	032007
	CIRCUITS INTEGRES/INTEGRATED CIRCUITS	
MA1	ICL 7660 CPA	047010
MA2	ICM 7555 IPA	047009
MX3	ICL 7135 CPI	047011
MA4	LM 339 AN	042007
MN5 à MN7	SN 7438 N	042002
MN8	SN 7447 AN	042003
	CONNECTEURS/CONNECTORS	
P1	SF20	071410
J1	CIP 20 BROCHES	071321
	DIVERS/MISCELLANEOUS	
FILM AFFICHEUR/DISPLAY FILM		504001
2 PIONS POUR AFFICHEURS/2 SOCKETS FOR DISPLAY		121401
4 VIS TCF 2,5X6 /4 TCF SCREWS 2,5 X 6		130503
1 BARRETTE FIXATION CONNECTEUR/1 CONNECTOR FIXING SUPPORT		141402
2 VIS TCF 2,5 X 5/2 SCREWS TCF 2,5 X 5		130513
DS1	AFFICHEUR 5082 7736/DISPLAY 5082 7736	035003
DS2 à DS5	AFFICHEURS 5082 7731/DISPLAY 5082 7731	035001
DS6 à DS8	DIODES LED HLMP 2300/LED DIODES HLMP 2300	031011
XMX3	SUPPORT CI 28 BRANCHES/CI SOCKET 28 PINS	090708

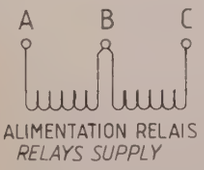

084202
J1 - P1
R70
R71
R39
C13
C12
MN 7
MN 6
R52
R31
R29
R40
C14
R33
R34
R35
C19
MX3
C4
C0
R8
C5
C6
R1
R0
R2
CR1
A62
R72
R4
R5
C8
C7
C3
R58
R63
Q8 Q7 Q6 Q5 Q4
Q9
R41
R42
R43
CR11
R44
R45
R46
R47
R48
CR12
R49
R50
R51
R52
R53
R54
R55
R56
R59
R60
MN8
MN5
MA4
MA1
MA2
R3
R11
C15
C11
C10
C9
C1
C2
CR13
CR5
CR4
Q3
Q1
Q2
R30
R28
R27
R25
R23
R22
R20
R18
R16
R14
R13
C17
C18
R6
R7
R26
R24
R21
CR3
R19
R17
R15
R12
CR2
R10
INSTRUMENTATION
AFFICHAGE LOCAL
LOCAL DISPLAY
C 51 1503



10 9			
GIGA INSTRUMENTATION	AFFICHAGE LOCAL LOCAL DISPLAY	C	511503



CABLAGE DES RELAIS / WIRING OF THE RELAYS						
ALIMENTATION RELAIS *RELAYS SUPPLY*			PONTETS *STRAPS*		*COMPOSANTS COMPONENTS*	
24V (OI) COMMUN COMMON	A	J6	1 - 4	fermés *closed*	CR 12 CR 11	BZX12 V.
	B	J4	2 - 3	ouverts *opened*	R 12 R 13	10 Kn
	C	J2				
5V (+) COMMUN COMMON	A	J7	1 - 4	ouverts *opened*	CR 2 CR 6	1N 4148
	B	J5	2 - 3	fermés *closed*	R 10 R 11	10 Kn
	C	J3				



ALIMENTATION RELAIS
RELAYS SUPPLY

DIODES SANS VALEUR : 1N 4148
DIODES WITHOUT VALUE : 1N 4148

2	238	Mise à jour schema, plan CI edition 2		28-8-85	HF
Édition	N° Modif	NATURE DE LA MODIFICATION		Date	Visa
Dessin. : Y. C.		Vérif :	Ing. : AM	Date : 11-4-85	Page 1 / 1

COMMUNICATION, REPRODUCTION ET UTILISATION INTERDITES

GIGA INSTRUMENTATION
91941 LES ULIS
FRANCE

COMMANDE DE RELAIS
RELAYS ORDER

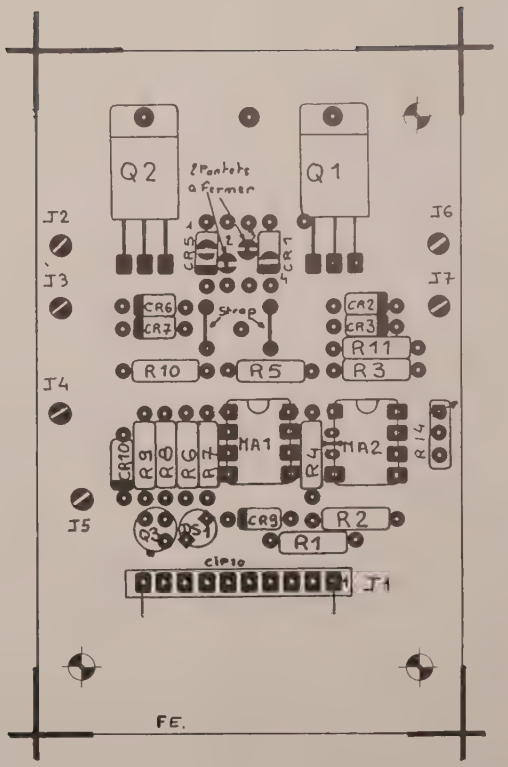
Indice	Code
S	501530

7.8 RELAY CONTROL (501530)

(Option 13 on GR 1310, GR 1308 and GR 1318)

The generators fitted with option 13 and with a frequency band which exceeds the octave are equipped with two switchable filters to ensure a rejection of the harmonic level to -40 dBc on the whole band. The switch is carried out by two mechanical relays which work in the same way as classical relays.
The two integrated circuits, MA1 and MA2, are assembled as hystereris comparators and the state of their outputs determines the conduction or the blocking of Q1 and Q2 transistors. The reference voltage of 2.5V from the board 501506 is applied after division to the inverted input of MA2. The R14 potentiometer allows adjustment of the tip threshold comparator. The MA2 output feeds the inverting input of MA1. The result of this double comparison determines the complementary use of Q1 and Q2. The conduction of the transistor frees the passage of the excitation current of the corresponding coil (work state). Inversely, blocking of the transistor determines the rest state. The DS1 LED diode facilitates the adjustment of the switching point (DS1 lights up when the MA2 output tips to + 15V).

REF	DESCRIPTION	CODE GIGA GIGA PART NR
	CIRCUIT IMPRIME/PRINTED CIRCUIT	081901
	RESISTANCES/RESISTORS	
R1	1K Ω 1% 1/4W 50ppm	311100
R2	1M Ω 1% 1/4W 50ppm	314100
R3	10KΩ 1% 1/4W 50ppm	312100
R4	475Ω 1% 1/4W 50ppm	310475
R5	10KΩ 1% 1/4W 50ppm	312100
R6	10KΩ 1% 1/4W 50ppm	312100
R7	10KΩ 1% 1/4W 50ppm	312100
R8	10KΩ 1% 1/4W 50ppm	312100
R9	1K 1% 1/4W 50ppm	311100
R10	10KΩ 1% 1/4W 50ppm	312100
R11	10KΩ 1% 1/4W 50ppm	312100
	DIODES	
CR1	1N4148	031003
CR2	1N4148	031003
CR3	1N4148	031003
CR4	1N4148	031003
CR5	1N4148	031003
CR6	1N4148	031003
CR7	1N4148	031003
CR9	1N4148	031003
CR10	1N4148	031003
	POTENTIOMETRE/POTENTIOMETER	
R14	10K	112310
	CIRCUIT INTEGRES/INTEGRATED CIRCUIT	
MA1	741CP	044008
MA2	741CP	044008
Q1	TIP120	032003
Q2	TIP120	032003
Q3	2N2222	032006
DS1	TIL 120 DIODE LED	031008
	DIVERS/MISCELLANEOUS	
J1	CIP10 RCBR 254	071319
J1	SF10	071408
J2	DF929 PICOTS	090302
J3	DF929 PICOTS	090302
J4	DF929 PICOTS	090302
J5	DF929 PICOTS	090302
J6	DF929 PICOTS	090302
J7	DF929 PICOTS	090302



2	203	Mise à Jour	11-4-85	YF
Edition	N° Modif	NATURE DE LA MODIFICATION	Date	Visa

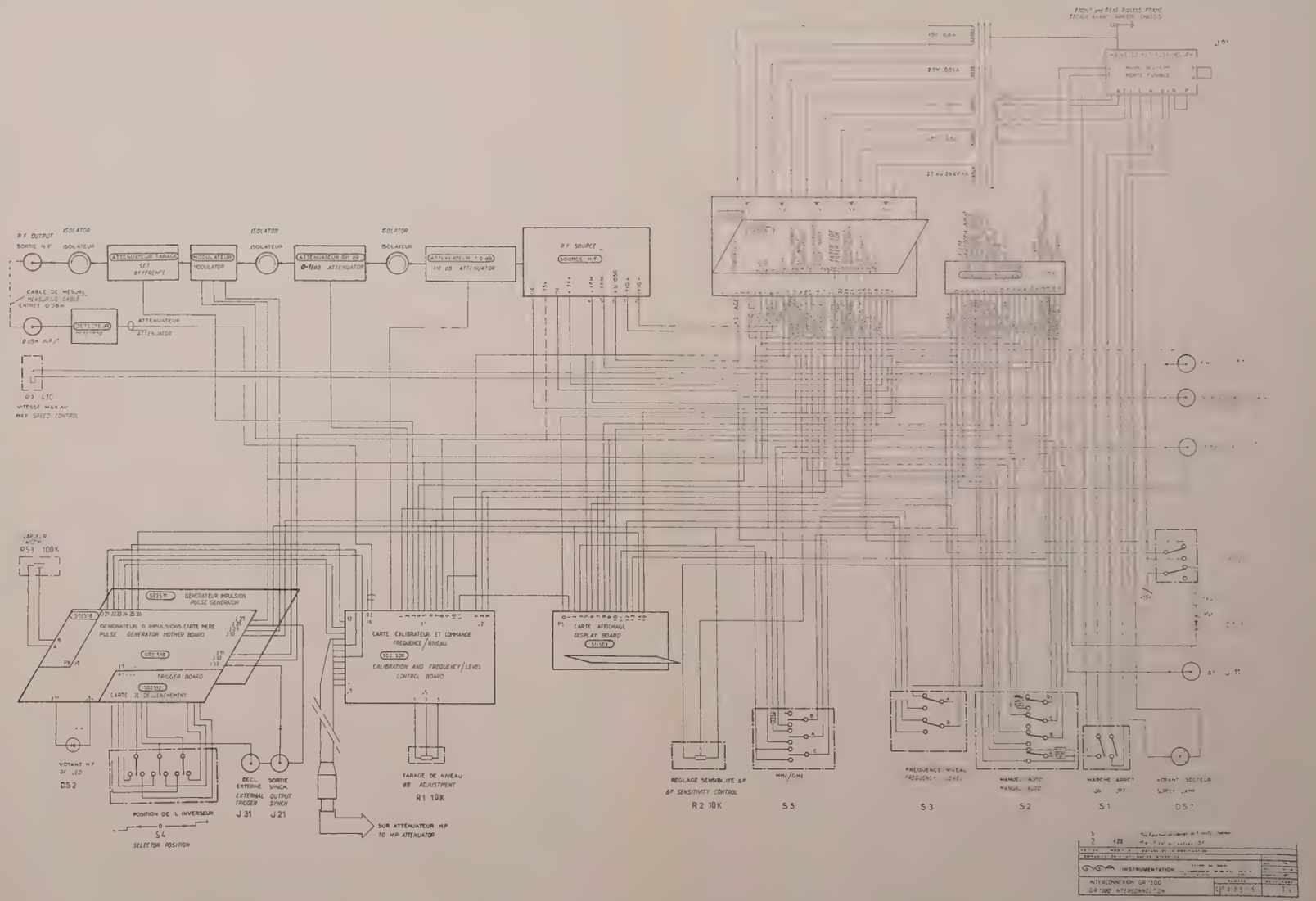
Dessin FGU — Page

GIGA INSTRUMENTATION
91941 LES ULIS
FRANCE

COMMUNICATION REPRODUCTION ET UTILISATION INTERDITES

COMMANDE DE RELAIS / RELAYS ORDER

Indice — Code


RF OUTPUT
SORTIE H.F
ISOLATOR
ISOLATEUR
ATTENUATEUR TARAGE
SET OFFSET
MODULATEUR
MODULATOR
ATTENUATEUR 0-11 dB
0-11dB ATTENUATOR
ATTENUATEUR 110 dB
110 dB ATTENUATOR
RF SOURCE
SOURCE H.F
CABLE DE MESURE
MEASURING CABLE
ENTREE 0.05m
0.05m INPUT
DETECTEUR
DETECTOR
ATTENUATEUR
ATTENUATOR
R7 47Ω
VITESSE MAXIMUM
MAX SPEED CONTROL
GENERATEUR IMPULSION
PULSE GENERATOR
GENERATEUR D IMPULSIONS CARTE MERE
PULSE GENERATOR MOTHER BOARD
TRIGGER BOARD
CARTE DE DECLENCHEMENT
CARTE CALIBRATEUR ET COMMANDE FREQUENCE/NIVEAU
CALIBRATION AND FREQUENCY/LEVEL CONTROL BOARD
CARTE AFFICHAGE
DISPLAY BOARD
VOYANT HF
RF LED
D52
POSITION DE L INVERSEUR
S4
SELECTOR POSITION
DECL. EXTERNE
EXTERNAL TRIGGER
J31
SORTIE SYNCH.
OUTPUT SYNCH
J21
SUR ATTENUATEUR H.P
TO H.P. ATTENUATOR
TARAGE DE NIVEAU
dB ADJUSTMENT
R1 10K
REGLAGE SENSIBILITE AF
AF SENSITIVITY CONTROL
R2 10K
S5
MHz/GHz
S3
FREQUENCE NIVEAU
FREQUENCY LEVEL
S2
MANUEL AUTO
MANUAL AUTO
S1
MARCHE ARRET
ON OFF
VOYANT SECTEUR
POWER LAMP
INTERCONNEXION GR 900
GR 900 INTERCONNECTION

QTE. NBR.	DESCRIPTION	CODE GIGA GIGA PART NR
	FACADE AVANT/FRONT PANEL	
2	Diodes LED TLR 114A/LED diodes	031008
2	Inverseur 2C 2P TA 6201 ON/ON /inverter	052004
1	Inverseur 3C 3P TA 6303 ON/OFF/ON /inverter	052007
1	Inverseur 4C 2P TA 6401 ON/ON /inverter	052008
1	Interrupteur+rond. 6-641-N2 + U 121/switch+washer	052010
3	Connecteur R 141559/connector	072501
2	Connecteur R 191381/connector	072603
2	Fixation CA en 2/fixation	090503
2	Clips LED 5MM/clip	091001
1	Voyant néon rouge 220 V BNF 3 R/red neon display	091701
6	Oeillet pour vis plaque av. 21100-464/Plastic washer for front panel screws	103464
2	Potentiomètre axe long P11 TYR 10 KOHMS/ Large axe potentiometer	115310
1	Etiquette de référence/reference label	121009
1	Vitrail rouge afficheur/red glasse display	121201
8	Vis TFBC 3 X 8/screw	134002
8	Rondelle AZ 3/washer	137001
4	Rondelle bakélite 6 X 12 X 1 /bakelite washer	137504
1	Cosse à souder dia.3 MM L:13 MM REF 5F / soldering spade	138504
8	Ecrou HU 3 X 2/bolt	139002
4	Rondelle A 368/washer	139901
4	Ecrou enjoliveur A 7099/ornamented bolt	139902
1	Façade avant français GR 1300/english front panel	141114
1	Façade avant anglaise GR 1300/french front panel	141213
	FACADE ARRIERE/REAR PANEL	
2	Connecteur R 141559/connector	072501
1	Connecteur R 141574/connector	072504
1	Connecteur 25 broches femelle/ connector 25 female pins	073902
1	Fixation CA en 2/fixation	090503
1	Bouchon GPN 300 B 58/plug	091307
1	Bouchon GPN 300 F 041 BNC/plug	091309
1	Embase secteur CORCOM 6 J 1/ mains voltage connector	091401
1	Fusible 0,5 A 6,3 X 32 D8TD TEMPO./fuse	091604
1	Etiquette secteur GR/GS/GU /mains voltage label	092002
1	Potentiomètre axe long P11 TYR 470 OHMS/ Large axe potentiometer	115147
2	Vis TCL 3 X 8/screw	132001
2	Rondelle AZ 3/washer	137001
2	Rondelle bakélite 6X12X1/bakelite washer	137504
2	Rondelle plate 3X8X0,8/flat washer	138007
2	Ecrou HU 3 X 2/bolt	139002
1	Façade arrière français/anglais/ rear panel french/english	143001

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8.2.2 Localization of sub-assemblies	8 - 2
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8 MAINTENANCE

8.1 INTRODUCTION

The aim of this chapter is to give information for emergency repairing of the GR 1300 generators and also for repairing quickly any failures that are encountered in performance tests (power-up problems, RF signal failure, etc ...).

The schematics and maintenance diagrams described in paragraph 8.3 show the procedure for rapidly localizing the microwave or electronic sub-assembly that is out of order.

As the different features of the sub-assemblies depend on the type of instrument used (frequency range, for example), it is necessary to initiate two levels of exchange.

- The sub-assemblies fully interchangeable without calibration renewal.

- The sub-assemblies interchangeable with calibration renewal.

8.1.1 List of fully interchangeable sub-assemblies

- General power supply 501504
- Mother board of pulse generator 502510
- Thumbwheels 502519
- 110 dB attenuator by steps of 10 dB
- Isolators
- Modulator
- Filter

8.1.2 List of interchangeable sub-assemblies with calibration renewal (see chapter 6)

- Source power supply 501506 : adjustment of + 15V oscillator of mini and maxi frequencies, of 10 mV/MHz and 10 mV/GHz.

- Local readout 511503 : converter adjustment.

- Frequency/level control 502509 : it is important to note the strap features. Adjustment of the detector adaptation and of 10 mV/dB.

- Pulse generator :

  - board 502511 : RC oscillator adjustment
  - board 502512 : trigger threshold adjustment
  - board 502518 : mini/maxi width adjustment

- Relay control 501530 (option 13) : relay switch adjustment.

- YIG box : readjust the source power supply

- 11dB variable attenuator)
)-> readjust the frequency/level
- Set attenuator   )   control

NOTE : When working on the general power supply 501504 during power-up, the board 501506 must not be removed.

8.2 ACCESS TO THE DIFFERENT SUB-ASSEMBLIES

8.2.1 Dismantling the case

. Remove the two screws located at the rear of each lateral edge and slide the top and bottom cover towards the rear in order to obtain access to all the circuits.

. Remove the large blue lateral covers which hide the screws that fix the cross bars.

8.2.2 Localization of sub-assemblies

The following can be seen at the rear of the instrument :

- The mains transformer is connected to the plug and to the voltage selector located on the rear panel. The switch and the light are at the front.

- Opposite the transformer, the microwave source is found inside a box to avoid RF leaks and to isolate it from transformer field. The source box is screwed to a metal plate which is fixed by four screws to the two sides of the case.

- The power supply block is located at the rear center. Its heat sink is fixed to the case. On the heat sink are located the MA4 and MA5 regulators, the ballast transistors of the YIG oscillator, Q1 and Q2 and also the MA6 regulator supplying the general +5 volts.

The board 501504 includes all the rectifying and filter circuits and is fixed on this heat sink block. After removing the fixations this circuit can be swung forward when board 501506 is removed and the rear panel swung down.

- The board 501504 includes, on the one hand, a J1 connector which receives the circuit 501506 in the horizontal or vertical position in order to facilitate maintenance and, on the other hand, a J2 interconnection slide where the links to the front, the source and the interface plug are located.

The following can be found on the front of the instrument

- On the right, the board 502509 fixed to the front by the level and frequency control switches, is also used to support the local readout board 511503.

The board 502509 is devoted mainly to all the attenuation and calibration adjustments.

- Circuit 502510 is located on the left side and just behind the front panel. It is fixed to the front by the "FUNCTIONS" switch and the different thumbwheels which adjust the modulation characteristics. In turn, this circuit is used as a support of circuit 502511 which includes the electronics of the pulse generator, for circuit 502510 which gives the synchronization pulse and for circuit 502512 which includes the interface for the trigger input. All these circuits, as well as the thumbwheels 502519 can be plugged in, in order to facilitate the maintenance. With the same aim in mind, the circuit 502511 can be plugged into the opposite side in order to stand out from the instrument while working normally.

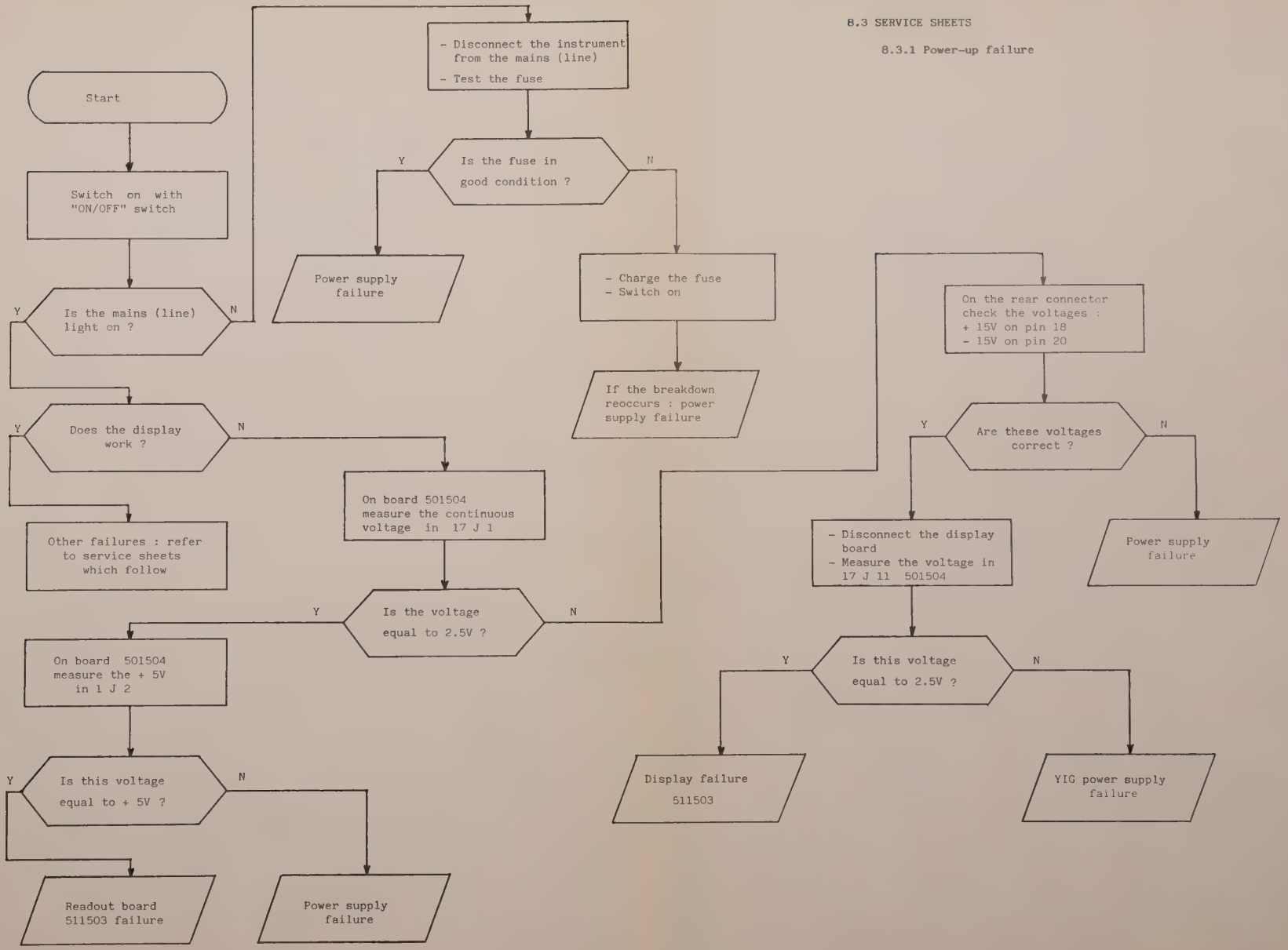
The following are located at the center of the instrument

The different microwave components. After the microwave source is located the attenuator by steps with a multi-pin plug and then, between two isolators, the variable attenuator with PIN diode (11 dB). The modulator is located behind the second isolator, then the set attenuator and finally a third isolator linked to the output plug.

NOTE : For instruments fitted with option 6 (see chapter 2) an isolator can be inserted between the source and the steps attenuator. For those fitted with option 13, the chain can be prolonged at the end by a filter, or two lowpass filters switchable by two relays, followed by a fourth isolator.

These different components can be taken out of the instrument by removing the sides which are fixed to the ends of the microwave chain and by desoldering the control wires of the variable and set attenuators as well as of the modulator. To remove and replace the semi-rigid interconnection cables, a special dynamometric spanner must be used.

8.3.1 Power-up failure


Start
Switch on with "ON/OFF" switch
Is the mains (line) light on ?
Y
N
- Disconnect the instrument from the mains (line)
- Test the fuse
Is the fuse in good condition ?
Y
N
Power supply failure
- Charge the fuse
- Switch on
If the breakdown reoccurs : power supply failure
Does the display work ?
Y
N
Other failures : refer to service sheets which follow
On board 501504 measure the continuous voltage in 17 J 1
Is the voltage equal to 2.5V ?
Y
N
On board 501504 measure the + 5V in 1 J 2
Is this voltage equal to + 5V ?
Y
N
Readout board 511503 failure
Power supply failure
On the rear connector check the voltages :
+ 15V on pin 18
- 15V on pin 20
Are these voltages correct ?
Y
N
- Disconnect the display board
- Measure the voltage in 17 J 11 501504
Power supply failure
Is this voltage equal to 2.5V ?
Y
N
Display failure 511503
YIG power supply failure

8.3.2 Power supply failure (1)

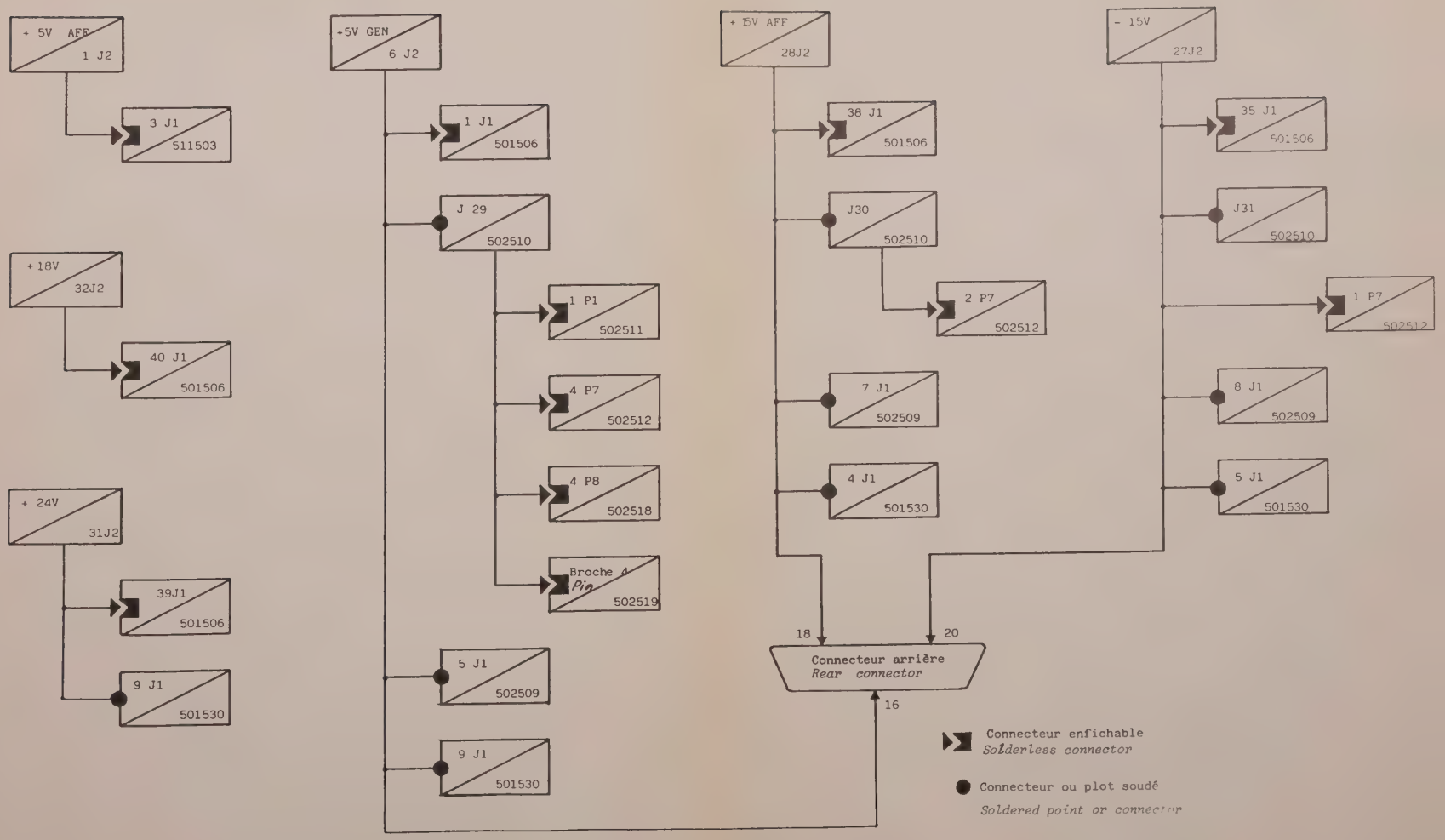
A defect or failure in power supply can have two causes :

- defect in the actual power supply
- defect in a board that is being used.

In order to find the cause of the breakdown, the power supply must be tested by disconnecting the boards being used one by one.
The following maintenance diagram facilitates the search due to the identification of each power supply network and the indicator on the connectors, soldered onto or plugged into the boards being used.
Once the breakdown has been located, the defective board can be repaired (general power supply board or the board being used).

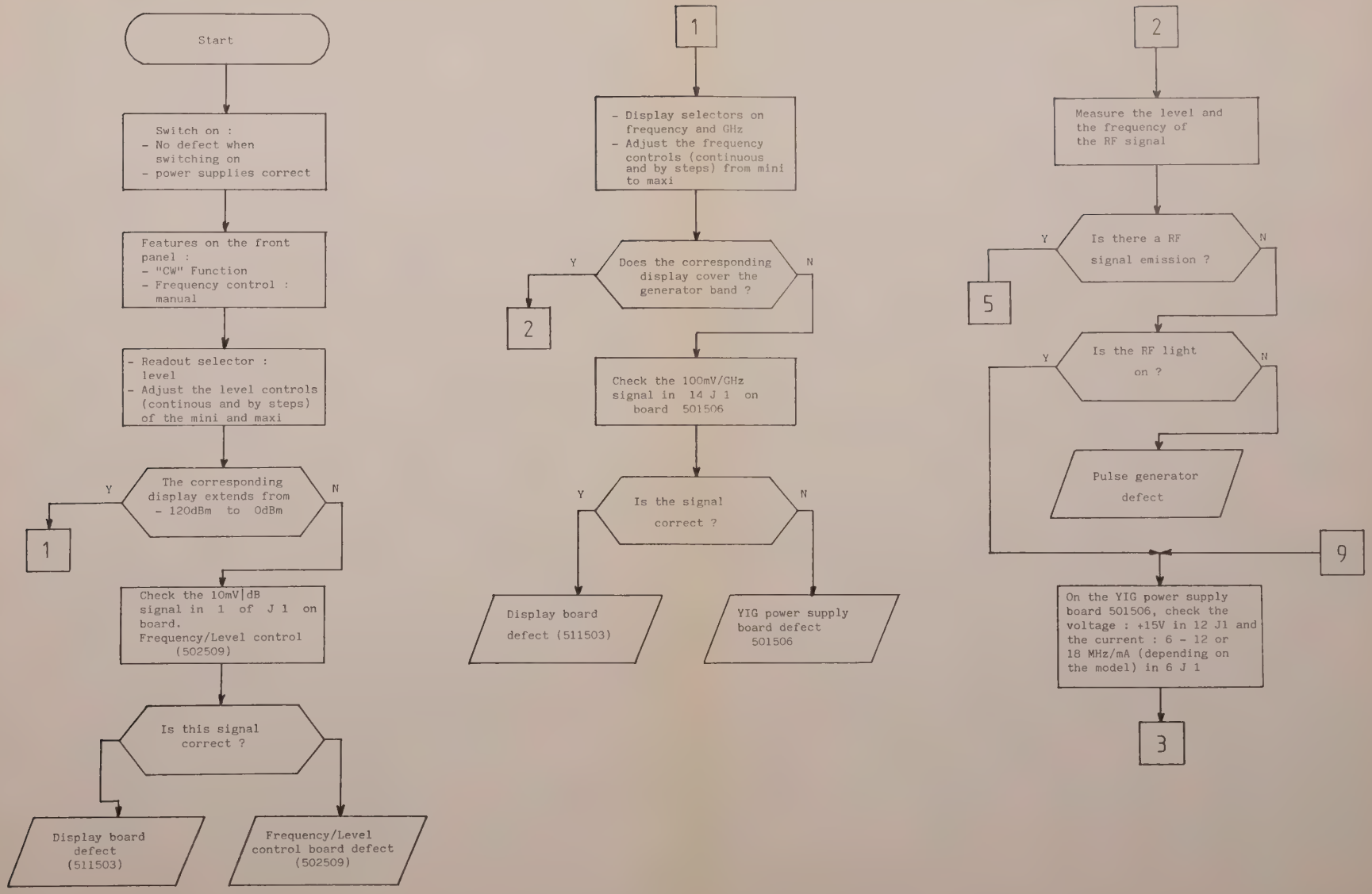
8.3.2 Anomalie d'alimentation (2)

Power supply trouble shooting (2)

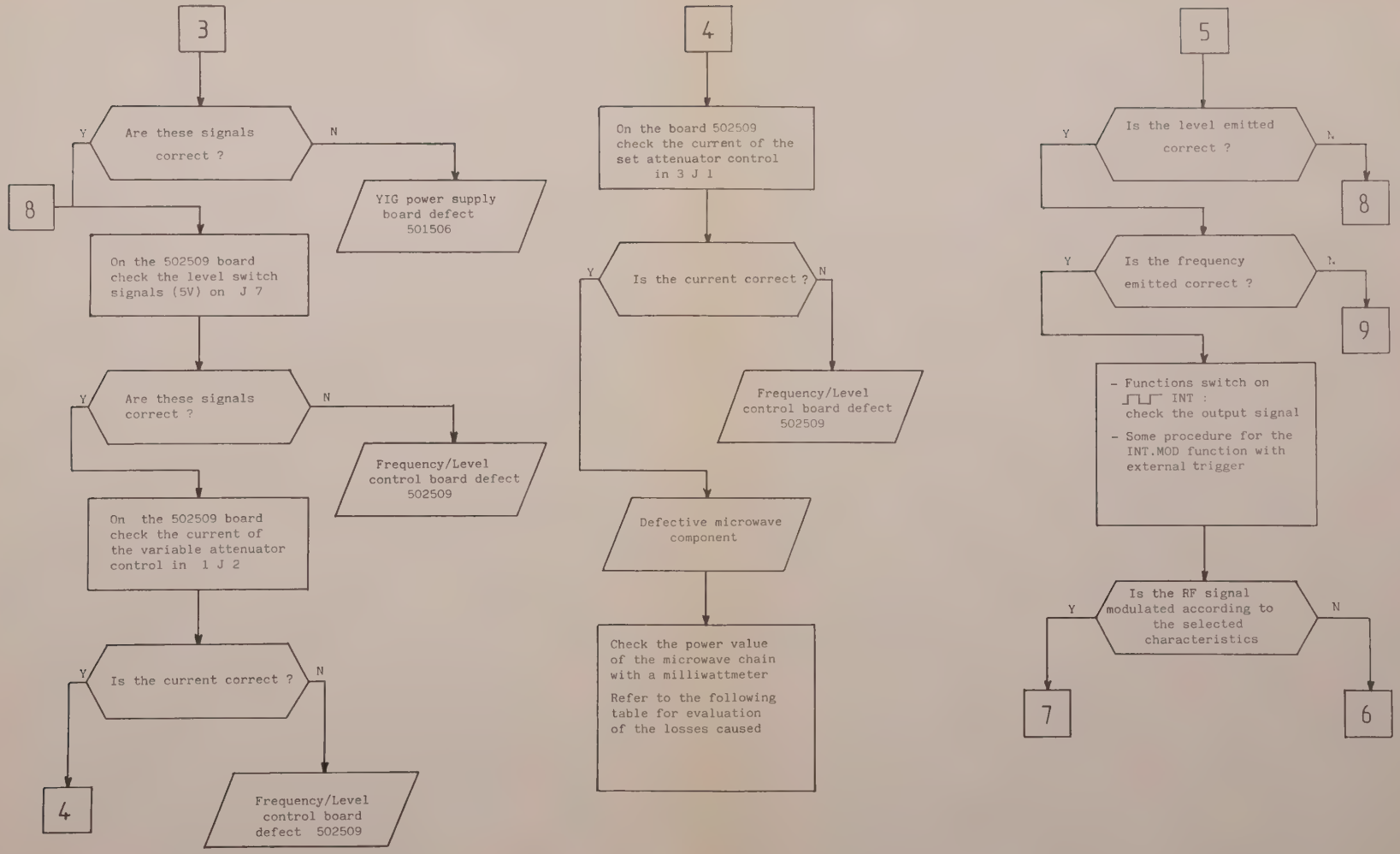


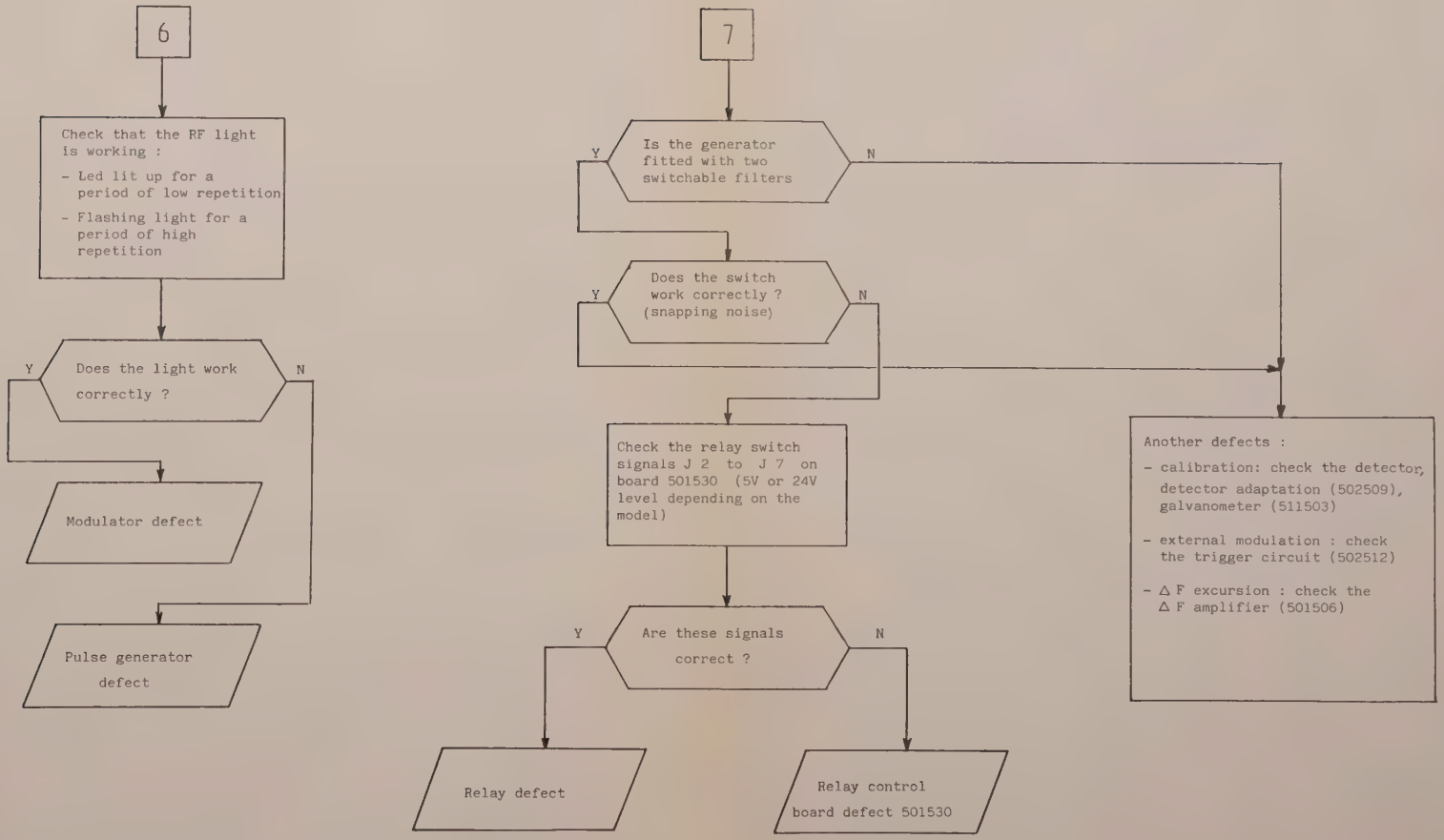
* + 24V ou + 5V selon le type du relais

+ 24V or + 5V, depends of the relays type


Start
Switch on :
- No defect when switching on
- power supplies correct
Features on the front panel :
- "CW" Function
- Frequency control : manual
- Readout selector : level
- Adjust the level controls (continous and by steps) of the mini and maxi
The corresponding display extends from - 120dBm to 0dBm
Y
N
1
Check the 10mV/dB signal in 1 of J 1 on board. Frequency/Level control (502509)
Is this signal correct ?
Display board defect (511503)
Frequency/Level control board defect (502509)
1
- Display selectors on frequency and GHz
- Adjust the frequency controls (continuous and by steps) from mini to maxi
Does the corresponding display cover the generator band ?
Y
N
2
Check the 100mV/GHz signal in 14 J 1 on board 501506
Is the signal correct ?
Y
N
Display board defect (511503)
YIG power supply board defect 501506
2
Measure the level and the frequency of the RF signal
Is there a RF signal emission ?
Y
N
5
Is the RF light on ?
Y
N
Pulse generator defect
9
On the YIG power supply board 501506, check the voltage : +15V in 12 J1 and the current : 6 - 12 or 18 MHz/mA (depending on the model) in 6 J 1
3

8.3.3 RF signal defect (2)


3
Are these signals correct ?
Y
N
8
YIG power supply board defect 501506
On the 502509 board check the level switch signals (5V) on J 7
Are these signals correct ?
Y
N
Frequency/Level control board defect 502509
On the 502509 board check the current of the variable attenuator control in 1 J 2
Is the current correct ?
Y
N
4
Frequency/Level control board defect 502509
4
On the board 502509 check the current of the set attenuator control in 3 J 1
Is the current correct ?
Y
N
Frequency/Level control board defect 502509
Defective microwave component
Check the power value of the microwave chain with a milliwattmeter
Refer to the following table for evaluation of the losses caused
5
Is the level emitted correct ?
Y
N
8
Is the frequency emitted correct ?
Y
N
9
- Functions switch on INT : check the output signal
- Some procedure for the INT.MOD function with external trigger
Is the RF signal modulated according to the selected characteristics
Y
N
7
6


6
Check that the RF light is working :
- Led lit up for a period of low repetition
- Flashing light for a period of high repetition
Y
Does the light work correctly ?
N
Modulator defect
Pulse generator defect
7
Y
Is the generator fitted with two switchable filters
N
Y
Does the switch work correctly ? (snapping noise)
N
Check the relay switch signals J 2 to J 7 on board 501530 (5V or 24V level depending on the model)
Another defects :
- calibration: check the detector, detector adaptation (502509), galvanometer (511503)
- external modulation : check the trigger circuit (502512)
- Δ F excursion : check the Δ F amplifier (501506)
Y
Are these signals correct ?
N
Relay defect
Relay control board defect 501530

8.3.3 RF signal defect (4)

Power value of the microwave assembly

YIG OSCILLATORS

YIG OSC.	201000	203000	204000	205000	206500	207004	207502	208006
Output power (dBm)	17	17	17	17	16	14.8	16	19

ATTENUATORS

Attenuator (110 dB)	230401	231801
losses (dB) maxi	1	2.5

Set attenuator	226001	226002	226003	226004
losses (dB) maxi	2	2	2	3

Variable attenuator	226101	226102	226103	226104	226105	226106	226107
losses (dB) maxi	2	2	2	2	2	3	3

MODULATORS

Modulator	227201	227202	227203	227204	227205	227206	227207
losses (dB) maxi	3.5	3.5	3.5	4.5	4.5	4.5	5.5

- ISOLATORS : Losses ≤ 1 dB

MODIFICATION Nr 296

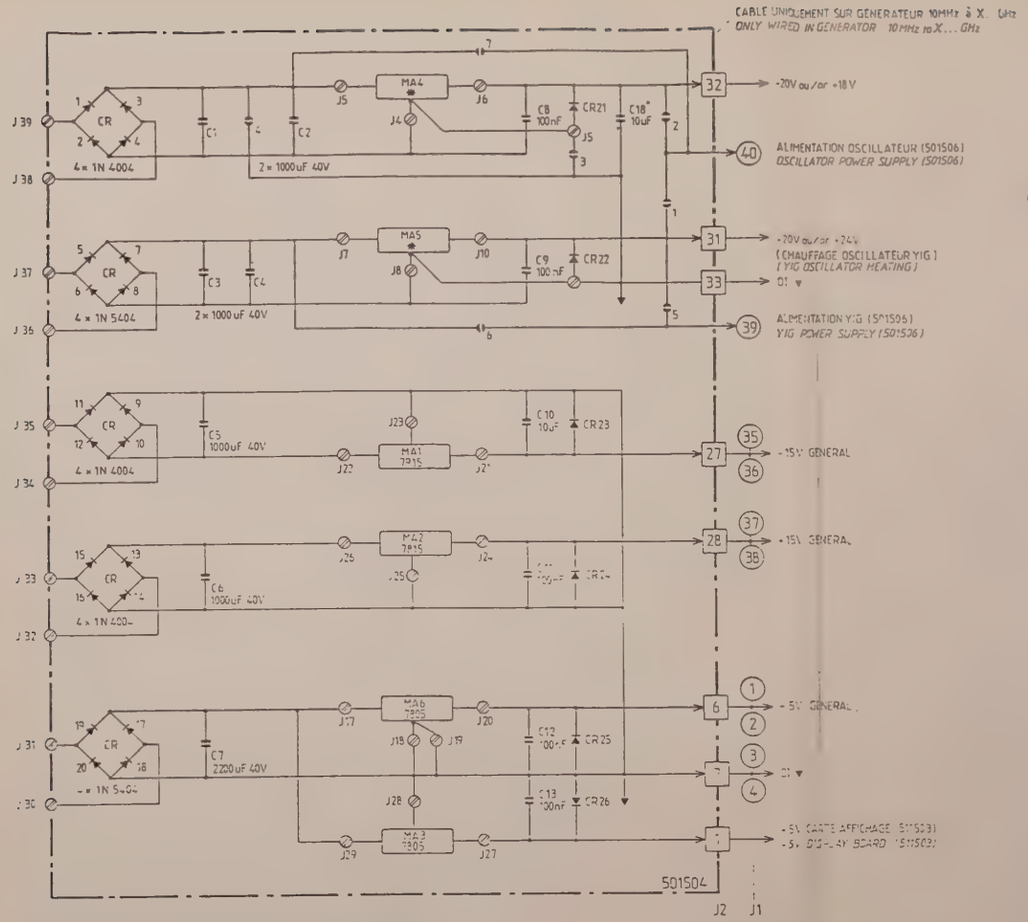
Instruments : GR 1300 - GS 1300 - GU 1300

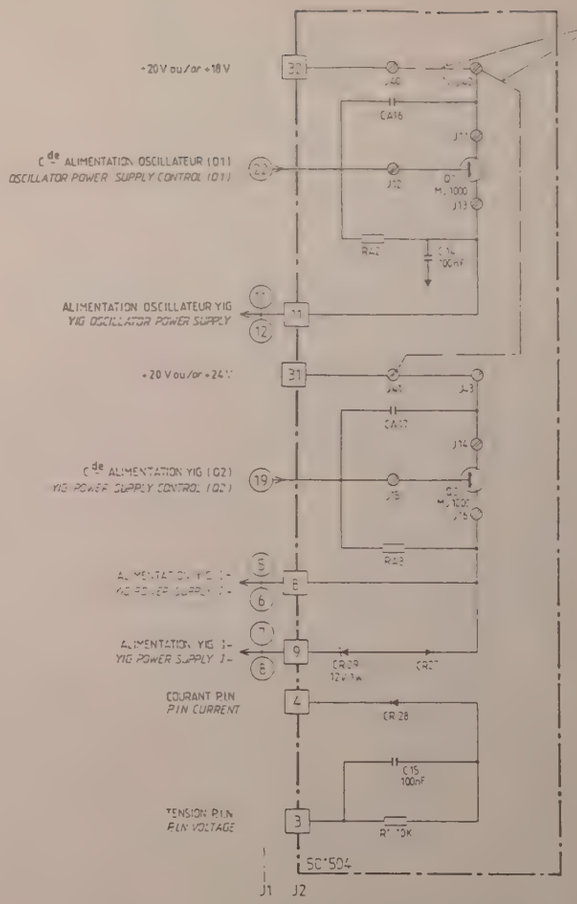
Date : DECEMBER 1986

On the power supplies board (501504) :
- a zener diode BZX 85c 12V 1W (GIGA part Nr : 031010) CR29 is added in serial to CR27 (YIG power supply).

On the YIG oscillator power supply (501506) :
- the zener diode CR7 is replaced by :
  - a zener diode BZX 55c 5,1V 400mW (GIGA part Nr : 031006) for frequencies lower than 8,5GHz.
  - a zener diode BZX 55c 12V 400mW (GIGA part Nr : 031007) for frequencies higher than 8GHz.

This modification concerns the instruments which serial number is greater or equal than 863912. It will be applied on the instruments going by the after sell department of GIGA INSTRUMENTATION.



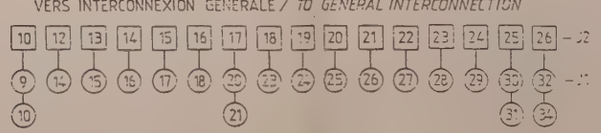


*

GENERATEURS / GENERATORS 10MHz à / to X... GHz	AUTRES GENERATEURS OTHER GENERATORS
MA4 LAS 1820 T03 (+20V)	MA4 MC 7815 T03 (+18V)
MA5 LAS 1520 T03 (+20V)	MA5 MC 7824 T03 (+24V)

court circuit / short circuit		J41 à / to J42	J40 à / to J42
	1	Fermé / Closed	Ouvert / Opened
	2	Ouvert / Opened	Fermé / Closed
	3	Ouvert / Opened	Fermé / Closed
	4	Fermé / Closed	Ouvert / Opened
	5	Fermé / Closed	Fermé / Closed
	6	Ouvert / Opened	Ouvert / Opened
	7	Ouvert / Opened	Ouvert / Opened

VERS INTERCONNEXION GENERALE / *TO GENERAL INTERCONNECTION*



VERS CARTE ALIMENTATION OSCILLATEUR YIG 501506
TO POWER SUPPLY YIG OSCILLATOR 501506

Q1-2, MA1 à MA5 : MONTES SUR RADIATEUR AVEC ISOLANT
Q1-2, MA1 to MA5 : SET ON DISSIPATOR WITH INSULATING

DIODES SANS VALEUR : 1N 4148
DIODES WITHOUT VALUE : 1N 4148

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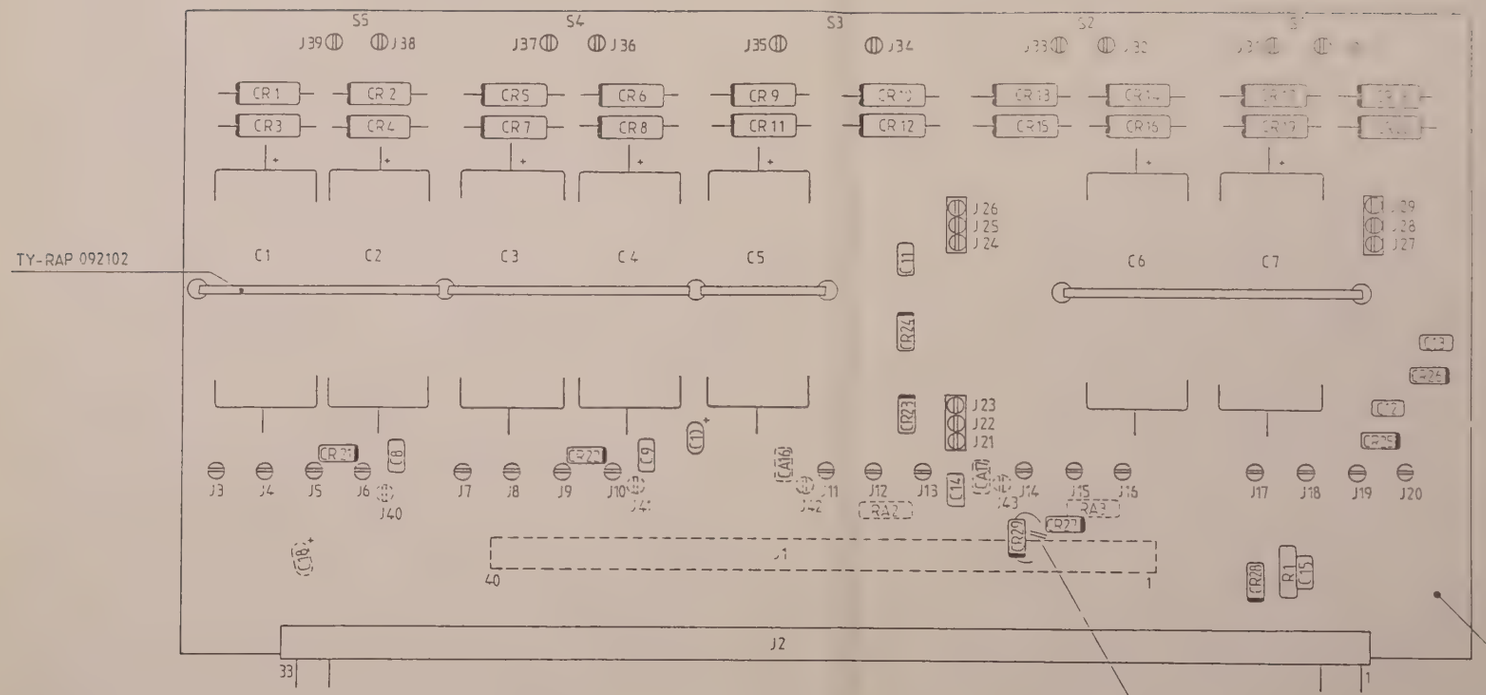
GIGA INSTRUMENTATION

CARTE ALIMENTATION GENERALE
POWER SUPPLY BOARD

S1501504



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GIGA INSTRUMENTATION 91941 LES ULIS FRANCE	COMMUNICATION REPRODUCTION ET UTILISATION INTERDITES	CARTE ALIMENTATION GENERALE POWER SUPPLY BOARD	Type	Code
				C501504

M O D I F I C A T I O N N r 3 3 5

Instruments : GR 1300 - GS 1300 - GU 1300 - GD 3000

Date : AUGUST 1987

A capacitor 10µF 35V (GIGA part Nr : 023610) is added on the oscillators which requires a -5V power supply in order to improve spectral purity.

This modification is applicable on and after the 03.08.87. It will be applied on the instruments sent back to the maintenance department of GIGA INSTRUMENTATION.

MP MASTER
MA23451